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the OIL AND GAS JOURNAL

Trends

Crude-Oil Production
By States — Page 74

CRUDE-OIL STOCKS 238,114,000 bbl. as of Jan. 8—down 2,878,000. One year ago 232,191,000 bbl.

GASOLINE STOCKS 77,654,000 bbl. as of Jan. 8—up 1,352,000 bbl. One year ago 82,586,000 bbl.

RESIDUAL FUEL-OIL STOCKS 55,731,000 bbl. as of Jan. 8—down 1,599,000. One year ago 72,795,000.

GAS OIL AND DISTILLATE 41,509,000 as of Jan. 8—down 922,000 bbl. One year ago 43,415,000.

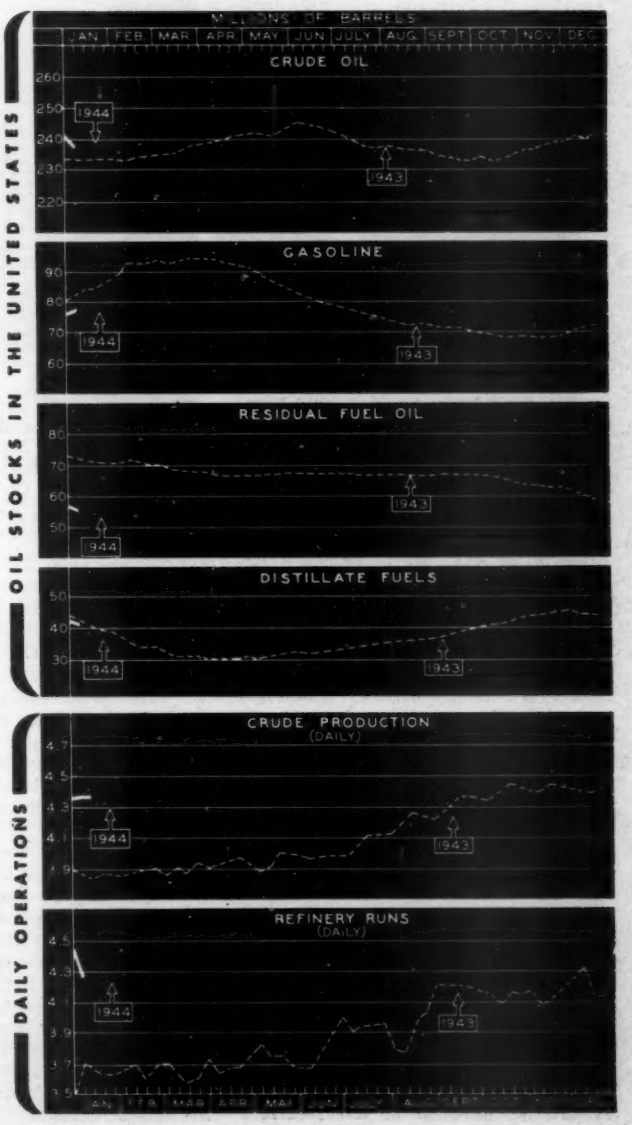
CRUDE-OIL PRODUCTION 4,374,655 bbl. daily average—up 8,435 bbl. One year ago 3,880,000.

REFINERY RUNS 4,264,000 bbl. daily week ended Jan. 8—down 189,000 bbl. One year ago 3,614,000.

A TREND of the past few months to which even greater significance will attach this year, is the increasing importance of foreign crude-oil production and refinery output in the petroleum supplies of this and other Allied countries. The production and movement of production from the fields and refineries of other countries are largely clothed in military secrecy, and the actual shipments into this country are not known. In regard to crude oil the narrowing margin between output of domestic fields and the crude runs to stills at refineries reflects the fact that more imported crude oil is being refined here. Finished products from refineries of the Caribbean area are also playing a more important part in the supplies of this country.

IT is known that as transportation facilities are arranged there will be further substantial increases in imports of crude oil and products this year. This will call for changes in the present movement of crude oil and products within the boundaries of this country and in Canada. In the East this might mean that pipe lines which have been converted from product to crude-oil arteries, would be reconverted to product service again. This program is related to suggestions that Gulf Coast refiners receive more imported crude oils and thus make it possible to ship additional Texas crude oils north into District 2. The imported crude oils and products may be made available this summer through the use of inland waterways. In this connection it has been pointed out that the recent projections of PIWC for 1944 anticipated a petroleum supply in this country averaging 4,987,000 bbl. daily. The estimated domestic crude-oil production plus the output of natural gasoline and associated products is 250,000 to 350,000 bbl. daily less than the estimated supplies that will be available in this country. This difference will be made up by imports.

THE greater reliance on foreign production will be significant in several respects relative to the Allied petroleum supplies this year. It has already relieved refiners in this country of part of the burden of supplying the Allied residual fuel-oil requirements. Rationing of civilian use of gasoline, fuel oil and distillates on a more severe basis than now appears probable would have been a 1944 development had the Allied war effort been as dependent on supplies of this country as it was in 1942-1943. The 1944 program calls for a complete pooling of all Allied petroleum production.



Industry Invited to Prepare Postwar-Petroleum Policy For Government Guidance

by Henry D. Ralph

WASHINGTON, D. C.—The postwar oil policy of the Government, both foreign and domestic, was the principal topic of discussion at the January meeting of the Petroleum Industry War Council here last week.

Petroleum Administrator Harold L. Ickes told the council that he has no plans for government control of the oil industry or government competition with it after the war, and flatly denied rumors to the contrary which have been circulating for several weeks.

At Ickes' suggestion the council created a committee of 16 members, headed by John A. Brown, president of Socony-Vacuum Oil Co., Inc., to formulate a national government oil policy for recommendation to the Government, including both foreign and domestic phases of a long-range petroleum program.

Special Committee Reports

The council's special committee on foreign oil policy, appointed at the December meeting under the chairmanship of A. C. Mattei of the Honolulu Oil Corp., made a brief report advocating development of world oil resources by private capital under governmental support. This committee was then dissolved on the ground that PIWC is not directly concerned with foreign operations since it was created by PAW to advise on domestic matters, but the new national oil-policy committee was empowered to consider problems of postwar government policy in the foreign field.

Ickes told the council that after the war he expects PAW to be dissolved and the oil industry returned to private operation and free enterprise. He denied that he has any plans for government control or operation, or that a determination has been made as to the disposition of government-owned oil industry facilities such as pipe lines and refineries.

However, he pointed out the need for a definite government policy toward oil in view of the strategic military and industrial position of this commodity and stressed the importance of this country maintaining adequate reserves to supply any possible future needs. He mentioned the possibility that the next generation might be faced with another world war in which petroleum might be of strategic importance, or might be faced with a world-wide shortage of oil for peacetime commercial and industrial needs. For this reason he declared it highly important that the Government adopt a definite policy for maintaining a strong oil industry with adequate reserves, domestic or foreign, looking far into the future as well as being concerned with immediate postwar problems such as disposition of government-owned facilities, handling Naval petroleum reserves, and development of oil from the public domain.

John A. Brown, New York, president of Socony-Vacuum Oil Co., Inc., who heads a committee of 16 oil men invited to recommend a long-range domestic and foreign oil policy for consideration by the government

Council members appeared satisfied that the Government has not crystallized any opinions regarding petroleum beyond the duration of the war, and that the field is open for the industry itself to offer the basis of a constructive policy. Operating under this invitation from Ickes, the scope of the new committee will be considerably broader than that of the PIWC committee on postwar adjustments, which to date has confined its discussions chiefly to technical problems such as possible markets for motor and aviation gasolines and the unscrambling of jointly owned facilities and disposition of government-owned facilities.

The special committee on foreign oil policy specifically endorsed both the report of the PAW Foreign Operations Committee and the resolution of the Independent Petroleum Association of America on this subject, although it withheld judgment on the FOC recommendation for an international oil compact. In addition, it is understood, individual members of the council told Ickes that continued existence of Petroleum Reserves Corp. as an active government agency is inconsistent with the views expressed both by PIWC and by Ickes himself as to the proper government policy on foreign oil development.

In announcing appointment of the new committee on national oil policy, William R. Boyd, Jr., chairman, said that the committee will begin its study immediately in preparation for the development of a recommendation for a government policy fundamentally designed to promote the developing and securing of crude-oil reserves and petroleum products the world over in a combined program of war preparedness and maximum peacetime progress of petroleum.

Members of the committee appointed by Chairman Boyd are:

Committee on National Oil Policy

Brown; Otto D. Donnell, president, Ohio Oil Co.; J. Frank Drake, president, Gulf Oil Corp.; William H. Ferguson, executive vice president, Continental Oil Co.; Walter S. Hallanan, president, Plymouth Oil Co.; George A. Hill, Jr., president, Houston Oil Co. of Texas; Eugene Holman, vice president, Standard Oil Co. (New Jersey); W. F. Humphrey, president, Tide Water Associated Oil Co.; J. C. Hunter, president, Mid-Continent Oil and Gas Association; A. Jacobsen, president, Amerada Petroleum Corp.; W. Alton Jones, president, Cities Service Co.; John M. Lovejoy, president, Seaboard Oil Co. of Delaware; Albert C. Mattei, president, Honolulu Oil Corp.; Charles F. Roeser, president, Roeser & Pendleton; Robert E. Wilson, president, Pan American Petroleum & Transport Co., and Ralph T. Zook, president, Independent Petroleum Association of America.

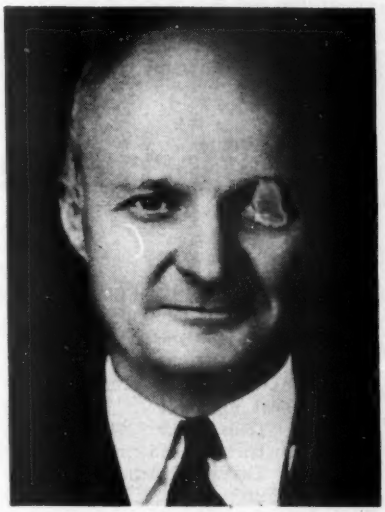
Automotive Engineers Work for War, Plan for Peace

by Arch L. Foster

DETROIT, Mich.—America's automotive engineers are planning as carefully and aggressively for peace as they are working to win the war, the activities of their annual meeting last week showed. Working day and night in scores of committees and in open technical meetings these men are throwing everything available into their job of supplying the military forces with the equipment necessary to win the war. At the same time they are rounding out long-range plans for the design and building of postwar's automobiles and planes and the manufacture of the products to operate them. Three thousand of these engineers met here in what was probably the most important meeting in the society's annals.

Extremely high-octane number fuels will not be used generally in the postwar period, C. B. Veal, executive secretary of the Coordinating Research Council told the fuels technologists. These superfuels are made for war purposes without regard to cost. An automotive engine made to operate on these fuels would be too heavy, too expensive and too noisy to suit the general public, Veal said. He summarized the situation by saying that the public will be interested in a smaller, lighter engine, but that the building of such engines for superfuels is difficult and they cannot be made lighter unless new materials of greater strength are made available. A most serious drawback is the high cost and high losses of crude unavoidable when such superfuels are produced.

Fuels with as high as 90 octane number will be looked for conceivably by about 1960, D. P. Barnard and R. F. Marschner, Standard Oil Co. of Indiana technologists, told the assembled engineers. Fuels of 100-octane number and higher, as well as the engines to use these fuels are very definitely in the class of "dreams" and cannot be expected to develop immediately after the war. Refining processes must be developed which will not consume such high percentages of crude, which will give high yields of gasoline before these "dream fuels" can become practicable for the use of the general motoring public, they stated. Forcing octane ratings to impracticable levels will cause the wasting of 9,000,000 bbl. of crude per year for each octane number gained; conservation of crude, especially under our present prospects of dwindling reserves, will force wise economy methods in refining and use of fuels.



W. S. James, chief engineer for Studebaker Corp., and recently elected president of the Society of Automotive Engineers, is a research man by profession and preference. He became affiliated with the U.S. Bureau of Standards in 1911, had charge of a laboratory during World War I wherein aviation fuels were studied. In 1924 he was made chief of the automotive powerplant section of the Bureau's Heat Division. Shortly after that he resigned and joined the staff of Hupp Motor Car Co., then went with Associated Oil Co. of California, but settled down in 1926 with Studebaker

J. R. Sabina, E. I. duPont de Nemours Co., recently elected vice president of the Society of Automotive Engineers for the Fuels and Lubricants Activity

Postwar Compression Ratios

L-head engines of compression ratios not higher than eight to one will be in general use after the war, according to E. J. Willis of Aluminum Co. of America. These engines need not operate at speeds higher than 3,500 r.p.m.; compression ratios above about eight to one offer no special advantages in either L-head or valve-in-head motors, Willis believes. Use of aluminum pistons and cylinder heads will permit greater spark advance without appreciable detonation. A more satisfactory spark timing under part-throttle conditions of operation will do more for gasoline economy than will boosting the compression ratio, he stated.

The conservative view regarding future cars was expressed by E. C. De Smet of Willys-Overland Motors, Inc. The postwar car will not be a dream car, but a practical machine built under the laws of economics, to operate satisfactorily under the business and sociological conditions which will exist in the postwar period. Plastics will continue to serve many purposes but De Smet cannot see a car in the near future made up of plastics almost entirely. Fabrication problems are too great, specific strength is too low with most plastics now known to make a plastic-bodied car practicable.

Vapor lock is inexcusable, and the solution of the vapor-lock problem is by no means insurmountable, in the opinion of R. J. S. Pigott of Gulf Research and Development Co. Three principles must be observed in designing fuel systems, Pigott said; (1) heat flow into the system on the intake side of the fuel pump must be controlled or eliminated; (2) flow

resistance in the system must be low enough so that the pressure drop will not produce more vapor-plus-liquid volume than the pump can handle; (3) flowmeters such as carburetor orifices cannot measure a mixture of vapor and liquid correctly but can handle only a homogeneous fluid, either liquid or gas.

"For high altitude work (airplanes) or hot gasoline (tanks)," Pigott summarized, "We must . . . . cut out all the idiotic resistances we now build into the suction side of the fuel system—no sharp elbows, large lines, no strainers; reduce the pump losses by improved design, no needle or globe valves, all valves designed for low resistance." Pigott takes the designers to task because, having the vapor pressure and knowing its existence and since volatility is a must in gasoline, the designers have not designed fuel systems with this unavoidable characteristic in mind.

Cause of Vapor Lock

Vapor lock in aviation-engine fuel systems will occur at temperatures far below that of the boiling point of the fuel, A. E. Robertson and R. Albright have reported and this is generally caused by dissolved air in the fuel. Gasoline may dissolve as much as 20 parts of air per 100 parts of gasoline and the amount which any fuel will dissolve is characteristic of that fuel. Solubilities of air in gasoline can be predicted with fair accuracy by means of the Bridgeman-Aldrich equation which was worked out from experimental determinations of air in gasoline samples of different composition. High aromatic content affects the solubility considerably and values arrived at by use of the equation are somewhat low.

Vapor-forming tendencies and vapor-lock characteristics can be predicted by means of curves and equations developed from experimental data by the CRC Coordinating Fuel Research Committee, and reported by E. W. Aldrich, E. M. Barber and A. E. Robertson. This method of predicting vapor forming and vapor locking tendencies utilizes the Reid vapor pressure and the standard A.S.T.M. distillation data. It has been worked out to simplify the work of the committee to permit making a close estimate of vapor lock properties from always available inspection results.

Utilization of secondary, or scrap, aluminum will enable the postwar automotive industry to gain the advanages of light weight for many car parts not now made from that metal, L. W. Kempf of Aluminum Co. of America, says, and at a cost not prohibitively greater than is the present cost of steel alloys commonly used. Secondary aluminum will be alloyed with more copper and silicon or both, with low magnesium content to enable castings to be made and processed to yield the finished parts.

A new method of test for cutting oils has been worked out by Pure Oil Co. technologists. The test is made on a lathe, using single-point tools, and the criterion is the comparative life of the cutting tool with different oils. In making an exhaustive study a relationship is worked out between tool life and cutting speed, and a curve is plotted. On logarithmic paper the points found by plotting tool life against cutting speed fall in a straight line. The tool life is taken to be the length of time under the standardized conditions the tool will cut before the cutting edge breaks down. Using speeds of up to 250 ft. per minute tool failure is abrupt and definite, these experimenters have found. They conclude that this tool life test can be used advantageously to determine the value of an oil for roughing cuts where finish is of secondary importance. Finish life of tools is not proportional to tool life and it was found desirable to develop a finish life test. They have found also that in doing heavy cutting the oil must have an antiweld compound in it, to carry the load when the oil cannot carry it, to prevent seizure and welding of the chip on the tool. Lighter work calls for high film strength, while antiweld agents act as abrasives, therefore a large percentage of antiweld agent is not desirable for oils used in light, fast cutting.

W. S. Morris Elected Chairman of A.I.M.E. Petroleum Division

W. S. MORRIS, vice president and general manager of East Texas Salt Water Disposal Co., Kilgore, Tex., has been chosen chairman of the Petroleum Division, American Institute of Mining and Metallurgical Engineers, for 1944. Morris, who has served as associate chairman of the division, member of the executive committee and chairman of the papers and program committee, will take office at the annual meeting of the institute February 21 in New York.

Graduating from University of North Carolina in 1924 with B.S. and C.E. degrees, Morris joined Empire Gas & Fuel Co., Bartlesville, Okla., as a junior engineer. Two years later he became a petroleum engineer for U. S. Bureau of Mines in Bartlesville, serving 3 years. In 1929 he joined Indian Territory Illuminating Oil Co., Bartlesville, as petroleum engineer, holding that post till 1936, when he was admitted to the Oklahoma bar.

W. S. MORRIS

Active in Association Work

From 1936 to 1942 Morris was field chairman for East Texas Engineering Association, and served as chairman of the southwestern division of production, American Petroleum Institute, in 1938. He founded the East Texas section of the A.I.M.E. and was its first chairman. He has held his present post with East Texas Salt Water Disposal Co. since September 1942.

The program for the petroleum division meeting in New York is being completed. Among papers to be delivered are: "Positive Colloid Muds for Drilling Through Heaving Shale," Donald C. Bond, Pure Oil Co.; "Air and Gas Lifts," R. V. Higgins, associate petroleum engineer, Petroleum and Gas Division, Bureau of Mines; "Waters From the Frio Formation, Texas Gulf Coast," F. W. Jessen, Humble Oil & Refining Co.; "A Study of the Possibility of Converting the Large-Diameter War Emergency Pipe Lines to Natural-Gas Service After the War," S. A. Swensrud, vice president of production, Standard Oil Co. of Ohio; "Experiences With Five-Year Courses in Petroleum Engineering," Harold Vance, head of department of petroleum engineering, Texas A. & M. College.

THIS WEEK

PRODUCTION—February production quota of 4,701,400 bbl. daily for February down 5,750 from January assignments. . . . California allocation raised 9,400 bbl., Rocky Mountains cut 4,400 and Midwest dropped 7,550. . . . ¶Changes mostly reflect productivity index, demand and transportation. . . . ¶Reduction in District 4 explained by transfer of tank cars to East Coast service, probably linked intimately with invasion plans. . . . Absence of other logical explanations for changes in transportation facilities usually precede military operations of considerable magnitude. . . . ¶Some operators question ability of California to meet higher quota. . . . ¶Next month's total includes 282,600 bbl. per day of natural gasoline and condensate, reflecting continued rise in these operations. . . .

DRILLING—Spurt in completions sustained through second week in January, indicating fast start for first quarter. . . . Completions averaged 45 wells a day for first half of January against 39 at same date year ago. . . . If rate is sustained, total for year would exceed 26,000 wells. . . . ¶Nearly 7 million feet of drill pipe covered by preliminary estimates of 1944 requirements. . . . ¶Production of tool joints rising sharply, will reach rate of 5,672 weekly by February 1. . . . Manufacture of other drilling equipment rising, some in proportion to tool joints and drill pipe, other items still below necessary levels. . . .

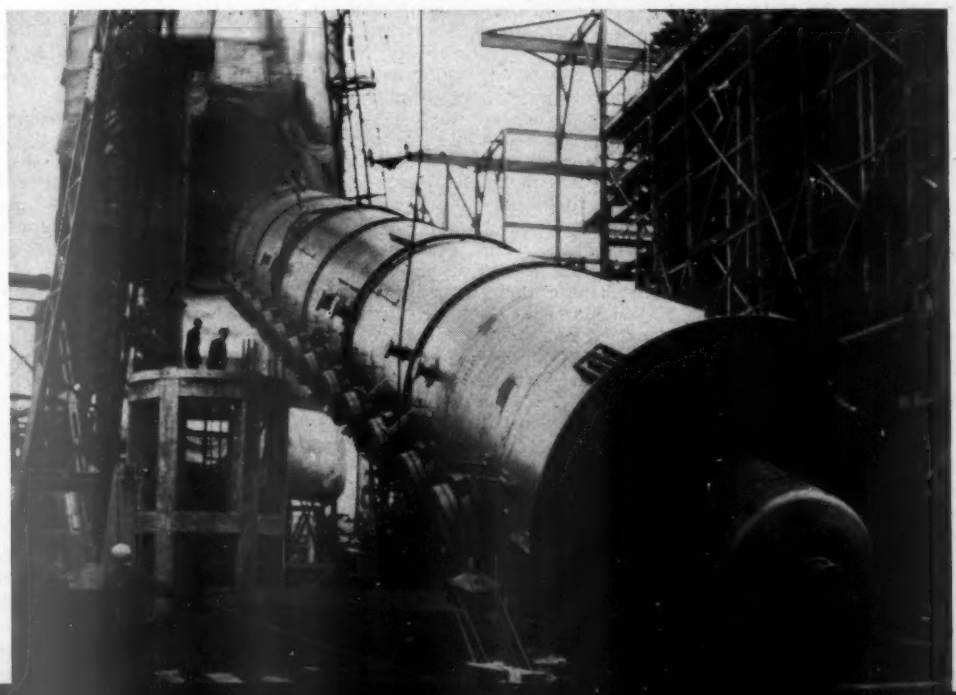
REFINING—Latest survey shows 12 more 100-octane plants will be completed before February 15, another 24 units by April 15, leaving 15 for completion later in 1944. . . . Forty-three such plants, either catalytic cracking or alkylation units completed and in operation. . . . Nine of completed total have been finished since November 1. . . . ¶District 2 refiners urge Defense Supplies Corp. to eliminate discrimination against operators in excess-profits bracket, in West Texas tank-car reimbursement program. . . .

TRANSPORTATION—Tank-car shipments to East Coast lag behind program by 56,052 bbl. daily, despite moderate recovery from more acute slump in December. . . . Federal agencies fighting against natural letdown in handling tank cars, following completion of pipe line. . . . ¶DPC calls for engineering report on breaks in southern leg of little big-inch line, the WEP 20-in. product system. . . .

INTERNATIONAL—PIWC accepts Administrator Ickes invitation to formulate and present long-range petroleum policy, both for domestic and foreign operations. . . . Sixteen members of council appointed to committee for preparing recommendations. . . . ¶Council declares continued existence of Petroleum Reserve Corp., an unsettling factor. . . . ¶Report accepted from PIWC emergency committee recommending government support of American nationals, rather than direct government participation in foreign operations. . . . ¶Sentiment against government encroachment in field of private business growing in intensity and the industry is presenting workable alternatives of proven merit. . . .

SUPPLIES—Gasoline inventories growing more critical on Pacific Coast. . . . Inclement weather helps to arrest national decline. . . . BUT, the over-all picture continues acute, threatens more reductions in civilian supplies on West Coast and Atlantic seaboard next summer. . . .

This equipment at Standard Oil Co. of Ohio's plant at Cleveland is symbolic of construction under way on 52 other 100-octane units on the 1944 program. The tower is 10 ft. 6 in. in diameter by 70 ft. and weights 82 tons



Greatest Number of Drilling Rigs in History to Operate This Year

by Frank A. Watts

Indications are that more rotary rigs will be in operation in 1944 than in any recent year. Manufacturers of pumping units are increasing production 36 per cent this month to a rate of 645 assemblies each 30 days. Preliminary tabulation of this year's drilling program shows that nearly 7,000,000 ft. of drill pipe will be needed. These and other pertinent data on the drilling and equipment-supply outlook are disclosed in the accompanying liberal excerpt from this month's report to the Petroleum Industry War Council by the PAW director of materials.

MANY items required for petroleum use are not now being manufactured at the rate these are needed for maintenance or repair uses or other essential operations. These include internal combustion engines, parts for engines and pumps, trucks, parts for automotive equipment, bearings, heat exchanger, condenser, and still tubes, steel valves, forgings, castings, and a number of other items. Many of these are required by those manufacturers of material which furnish the oil field supply companies and distributors with material needed by both domestic and foreign petroleum production operators. These items are also required by the petroleum equipment manufacturers for ultimate use by petroleum operators and are frequently acquired by operators directly from the manufacturers.

Equipment manufacturers are returning to the production of those items required in your operations. Tool joints are now being delivered at the rate of 4,824 a week. This production is an increase of 26 per cent over the 3,836 weekly rate of 1 month ago. Tool joint manufacturers now have a backlog of orders for 183,298 tool joints, which, at the present rate, is equivalent to 38 weeks of production. Tool joint manufacturers estimate that before the first of February their production will have increased to 5,672 units each week, when the backlog will be equivalent to their total production for 32 weeks. Most tool-joint manufacturers are striving to increase their production to place supply and demand for both foreign and domestic production operations in balance and to reduce to a normal level their backlog of orders.

Pumping Units Increased

It is indicated that pumping unit manufacturers have a backlog of orders for 4,737 units. At the current rate of production of 472 units a month, this number is equivalent to the production of all manufacturers for 10 months. Manufacturers indicate that by the last of this month production will have been increased to 645 units. The backlog of orders will then equal the total production of units for a period of 7 months. This relation does not extend to all items manufactured by the 427 petroleum equipment manufacturers who receive allotments of raw materials from PAW as Claimant Agency. However, the situation does extend to a number of items other than pumping units and tool joints, and particularly includes maintenance and repair parts for existing equipment.

Because petroleum operations will accelerate during 1944, two things are indicated. First, if the manufacturers who serve the petroleum industry are going to assume and dispatch their share of the responsibility of supplying the steadily increasing demands for petroleum products, then they must increase their production of materials required for petroleum use to the point where supply and demand are in balance both for foreign and domestic operations. Second, petroleum operators should keep well informed on the material supply situation and, to the extent they are able to plan their operations, should order materials sufficiently in advance to enable them to have access to materials by or before the day they are required for use. As rapidly as manufacturers, suppliers, and distributors increase their production of petroleum materials and place supply of and demand for materials in balance, petroleum operators will be able to depend on their normal suppliers for normal deliveries of material, without need for projecting plans as far into the future as is now necessary.

Currently, 1,320 rotary rigs are operating in this country and Canada. This is a slight reduction from the 1943 high, which was reached December 21, when 1,363 rotary rigs were operating. Weather conditions are now retarding work and during the next 2 months will delay drilling. Thirteen hundred and twenty rigs are, however, an increase of 83½ per cent over the 713 rotary rigs operating 1 year ago.

Rotary Drilling Needs

During December PAW conducted a nation-wide survey in an effort to determine the 1944 needs of the petroleum industry for rotary drilling machinery. Preliminary tabulations of the replies indicate that the industry as a whole plans to operate nearly 10 per cent more rotary rigs during 1944 than were operated during December. As a matter of fact, present indications are that more rotary rigs will be operated during 1944 than have been operated during any recent year, including 1940 and 1941. To meet that objective, a comparatively large amount of additional drilling machinery must be supplied. A portion of the additional rigs will be new equipment now being manufactured or to be ordered and produced later. The balance of the additional rigs are now stacked and will be rehabilitated and thus require considerable new equipment before they can be placed in operation. The 1944 drilling efficiency of the average rig will doubtless fall below normal. However, the total materials required for the indicated 1944 program will exceed requirements for recent programs, including those of 1940 and 1941.

The replies of individual operators will be kept confidential and will not be disclosed by PAW. Preliminary tabulations of the replies received to date indicate the 720 internal combustion drilling engines, 150 hp. and larger in size, will be required during this year for new rigs or replacements on old rigs. It is indicated that 210 oil-field boilers, 350-lb. working pressure and 150 hp. in size, will be required for domestic operations during this year. The tabulations indicate further that a total of 6,890,000 ft. of drill pipe, including 5,200,000 ft. of

4½-in. will be required for domesti: operations during this year. The 1,-690,000 ft. of sizes other than 4½-in., consist principally of 3½-in. drill pipe. Complete information on the rotary drilling machinery survey will be made available for distribution as soon as completed. This should be before February 10.

As part of PAW's program to reduce to a minimum the time which elapses and the paper work which is handled between the day a petroleum operator determines a need for material and the day the material is available for use, Preference Rating Order P-98-b has been amended and is being reissued. As indicated last month, the amended order makes it unnecessary to use preference ratings for the acquisition of rotary rock bits or core bits.

Order Procedure Changed

No copies of delivery orders for less than $100 worth of material will be sent to PAW. Henceforth, where delivery orders include more than $100 worth of MRO material, one copy only of the delivery orders will be forwarded to the proper PAW district office for information purposes. This is also true of controlled materials, including refinery tubes, line pipe, tubing, etc., when no single item on a delivery order costs more than $500 or the total value of material included in the order does not exceed $2,500.

The PAW District offices will forward to Washington the copies of those delivery orders which include items of material the manufacture and delivery of which are scheduled under Order M-293.

The amended order does not differentiate between operators who during 1942 drilled more or less than 40,000 ft. of hole. All production operators, to the extent they are able to forecast their needs for controlled materials, will now be required to file PAW-35 applications at least 90 days in advance of the quarter the materials are required for use. They are also required to place delivery orders for all controlled material allotted by PAW no more than 30 days after an allotment is received. Supplemental applications for additional allotments may be filed for delivery from regular mill rollings, mill stocks, or M-21-b-2 stocks.

Recent procedural revisions will make field stocks and mill stocks more flexible than they have been heretofore. Oil field supply companies on field stocks, and pipe mills on mill stocks, are instructed to reduce to a practical minimum stocks of slow-moving items and to increase their stocks of those items in greatest demand. Present plans are that a maximum of 40,000 tons of casing, tubing, and drill pipe be delivered during January, February, and March from fields and mill stocks.

Petroleo Interamericano Editor and Research Manager Visiting Latin America

DR. OSCAR B. IRIZARRY, editor of Petroleo Interamericano, Latin American affiliate of The Oil and Gas Journal, and Mitchell Tucker, manager of the research department of the two publications, left Miami, Fla., January 5 by plane on a several-weeks' trip to oil centers of South America and the Netherlands West Indies.

They will secure first-hand information on operating conditions in the oil fields and refineries which, in 1944, are to play a major part in furnishing petroleum for the Allied war machine. The present program calls for a record production from the fields and refineries of most countries to the south. Special attention will be given to the equipment and materials required by operators in order to carry on the expanded operations of this year.

A study will also be made of developments to be expected in South American oil operations in the post-war period. Present plans assure that continent will play a much more important part in world oil operations after the emergency ends than it did in the prewar period.

To many parts of the oil country of Latin America it will be a return trip for Irizarry. The bimonthly publication, of which he became editor last year, has received high praise from the Spanish-speaking and English-speaking peoples of the active petroleum areas which he and Tucker will visit. The first report of the trip will appear in the next issue of Petroleo Interamericano.

Mitchell Tucker, left, and Dr. Oscar B. Irizarry board a Pan American Clipper at Miami's Dinner Key base, en route to South American points

Plans for Superhighways Presage New Era for Oil Demand After War Ends

by Henry D. Ralph

WASHINGTON, D. C. — A nationwide system of interregional highways was recommended as a postwar project by President Roosevelt in his January 10 message to Congress. The system would include 33,920 miles of express highways, connecting all regions and major cities. Although this is only 1 per cent of the nation's highways and streets, the system would carry 20 per cent of all traffic.

The building and relocation of existing highways would provide work for an estimated 2,000,000 men.

The plan was drafted by the president's National Interregional Highway Committee, headed by Commissioner of Public Roads Thomas H. McDonald, and was sent to Congress with a special message from the president.

The system follows routes of existing federal-aid highways, and a large part of the project would involve relocation, improvement and modernization of present roadways to bring them up to the standards recommended in the committee's report. The plan calls for an expenditure of $750,000,000 a year, divided almost equally between urban and rural sections.

"Its development," the president said, "will establish a transcontinental network of modern roads essential to the future economic welfare and defense of the nation."

Recommended standards for the superhighways would eliminate congestion, stop lights, headlight glare, steep hills, sharp curves and narrow pavement, as well as "constricting roadside developments." A typical heavily traveled stretch of the system would have entries and exits at selected points only, and grade separations at all intersections. A 300-ft. right-of-way, fenced and attractively landscaped, would flank the four-lane highway with its 15-ft. dividing strip. The highways would have occasional moderate grades, easy superelevated or banked curves at infrequent intervals, and continuous unobstructed view ahead for at least 800 ft.

The system would incorporate routes leading directly into the larger cities, a new policy for federal-aid road building. In the past, federal-aid money has been prohibited for city streets on the grounds that the mud of rural highways has been the greatest traffic barrier. Today, the committee reports, congestion on transcity routes is the chief impediment of traffic.

Prompt Designation Advocated

The committee recommended immediate designation of the interregional system, "so that federal, state and municipal authorities may agree on the location of the roads and streets to make up the national routes." Some of the advance planning is already under way, owing to previous legislation, but the question of obtaining rights-of-way is now of paramount importance.

The president urged Congress to act quickly in authorizing joint designation of the system by the federal Government and state highway departments, to facilitate acquiring rights-of-way. The routes should be decided and the land acquired by the time the project is needed for postwar employment, he indicated.

He also urged that the actual routes of the new highways be left fluid, to prevent exorbitant rise in prices. Two or three alternate routes, the president said, should be surveyed, and the cheapest route of the three made the final choice.

A total of 29,450 miles of rural highways and 4,470 miles of urban roads and streets approximate the routes of the 33,920-mile system. By regions, these mileages are, respectively: 1,093 and 236 miles in New England; 1,682 and 594 in the Middle Atlantic; 4,105 and 873 in the East North Central; 3,854 and 467 in the West North Central; 3,558 and 652 in the South Atlantic; 2,609 and 380 in the East South Central; 4,088 and 512 in the West South Central; 5,662 and 372 in the Mountain; and 2,718 and 384 in the Pacific states.

Moderate Decline in Production Quota Is Issued for February

WASHINGTON, D. C. — Crude-oil production rates for February certified to the states by the Petroleum Administration for War total 4,701,400 bbl. per day of all petroleum liquids, including 282,600 bbl. per day of natural gasoline and condensate.

This is 5,750 bbl. daily below January certifications. Reductions were made in Districts 1 and 2 because of declining productive capacity and in District 4 because of insufficient tank cars, but California was boosted 9,400 bbl. per day.

The quota of 282,600 bbl. daily of natural gasoline and condensate is an increase of 5,050 bbl. above January and represents another record output for petroleum hydrocarbons in that category.

PAW PRODUCTION QUOTAS

	February	January
District 1:		
New York	13,400	14,000
Pennsylvania	42,800	43,600
West Virginia	16,600	16,400
Total District 1	72,800	74,000
District 2:		
Illinois	227,600	227,700
Indiana	14,000	14,400
Kansas	291,100	291,200
Kentucky	28,100	29,000
Michigan	50,200	56,200
Nebraska	1,200	1,300
Ohio	9,400	9,350
Oklahoma	356,000	356,000
Total District 2	977,600	985,150
District 3:		
Arkansas	81,780	81,700
Louisiana	375,700	375,700
Mississippi	46,000	48,000
New Mexico	116,600	116,600
Texas	2,018,000	2,018,000
Total District 3	2,638,000	2,640,000
District 4:		
Colorado	7,000	7,000
Montana	24,000	23,800
Wyoming	98,800	103,400
Total District 4	129,800	134,200
District 5:		
California	883,200	873,800
Total United States	4,701,400	4,707,150

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Puncturing Postwar Balloons

PETROLEUM and automotive technologists at the Detroit S.A.E. meeting last week served their industries and their country in frank statements regarding probable trends in automotive design and fuel properties of the postwar period.

Their conclusions that, after the war, the two industries will start about where they left off previous to Pearl Harbor, will not be welcomed by those who have insisted that the war's technical novelties can be utilized immediately in peacetime activities. These enthusiasts have visioned a family car powered with a new-type engine burning 100-octane fuel and racing across the country at high speeds. Some have interpreted the new power in terms of economy, the postwar car to cost much less, with 50 or more miles per gallon of gasoline.

Those connected with research and development and with practical operations, at the Detroit meeting, punctured these and many other postwar balloons. They and their associates know better than anyone else the meaning of what has been accomplished in the applied technology of their industries under the war's impetus. They are also realists and are familiar with the limitations of what can be done in the future with a return to normal operating conditions.

On the automotive side there are definite restrictions relative to changes in engine design. These involve metals and over-all service to users. In regard to fuels, the use of the highest-octane gasolines in automobiles and other motor vehicles, even if engines could be designed to use them, would be costly. Operating losses are high in the production of aviation fuels, each octane number, according to one Detroit speaker, resulting in the waste of 9 million barrels of crude oil yearly.

It is true that improvements in processing methods will reduce these losses. It is equally true that engine manufacturers will be able better to adapt engine design to the higher-octane fuels.

But these changes will not come overnight. The postwar period will bring a return to the economic tests, not only in the case of automotive power, but also in the several applications of aviation. Consumers' views will change if they are asked to pay the higher costs of new products directly instead of those costs being absorbed through increased public debt and high taxes.

The petroleum and automotive industries have done a good job through the years in coordinating their technical developments so that the consumer has had constantly improved performance at low prices. Any changes in these policies in the form of innovations which have not withstood all the tests of peacetime operations certainly have no place in the future planning of either industry.

Fortunately, in the case of petroleum refining, most of the government and privately owned aviation plants can be adapted to the production of postwar fuels, which will be slightly higher in octane rating than those of 1941. Investment costs when plants are taken over by refiners must take into consideration conditions as they will prevail with a return to competitive operations.

In brief, the industry's technicians and economists are pointing out that, while taking full advantage of developments of the past 2 years, refiners and marketers should now be getting their houses in order with plans based on the actualities of peace and not the abnormalities of war.

Twenty Parties Assigned to Field Projects in U.S.G.S. Expanded Program

WASHINGTON, D. C. — The U. S. Geological Survey now has 20 parties in the field searching for potential oil-producing structures, implementing the renewed emphasis upon petroleum research made possible by an increased appropriation last year.

Earlier in the war, when shortages of metals were acute and the petroleum reserve appeared adequate, U.S.G.S. cut its geological investigations in the oil field to a bare minimum. Now, with the situation virtually reversed, and with a considerably expanded budget, the survey is concentrating heavily on petroleum. The present program, mapped out through the current fiscal year, will include both regional stratigraphic studies and areal structural investigations.

Two branches of the U.S.G.S. are most active in the program, the geologic branch, headed by Chief Geologist Gerald F. Loughlin, and the conservation branch, of which Hale B. Soyster is chief. In general, the regional stratigraphic investigation will be done by the geologic branch, the structural studies in smaller areas of public and Indian lands by the conservation branch, although some of the projects overlap.

With a budget of approximately $380,000, of which $300,000 was appropriated by Congress for stratigraphic surveys, $50,000 transferred from the conservation branch, and $30,000 representing last year's budget, the geologic branch now has 13 parties working, and some others are contemplated. The budget for this work is higher than ever before. Before the war, an annual U.S.G.S. budget for both oil and coal investigations was $90,000 to $100,000. In 1942 it dropped to $40,000, and the regular budget, exclusive of special appropriation for the current fiscal year was $30,000.

The type of work being undertaken by the geologic branch is regional stratigraphy, both subsurface and surface, of large areas, such as basins or similar geologic provinces. The work will involve accumulation of data for maps and stratigraphic sections showing such features as thickness of sedimentary formation, changes in facies or porosity of oil-producing formations or possible oil formations, margins of producing or possible producing zones, relations and extent of lenticular sands.

The object of the studies will be the delimitation of broad areas favorable for exploration.

There has been some difficulty in locating sufficient trained geologists to carry on such an expanded program. Mr. Loughlin said, but the staff is now fairly complete. Seventy new men, transferred from other sections of the U.S.G.S. and those acquired from other government departments now provide a staff of about 100.

Specific Projects

California.—The east border of the Los Angeles Basin, including the western part of the San Bernardino Valley and the eastern part of the San Gabriel Valley, as well as overlap possibilities in Miocene and Pliocene formations. The Salinas Valley and adjoining areas; overlap possibilities, particularly in Miocene of eastern part of the valley. Eocene stratigraphy of the San Joaquin Valley to aid in the correlation of the subsurface section. Project not yet selected. The Santa Maria basin, a study of overlap possibilities involving a greater part of the Tertiary. All of these will be regional stratigraphy to seek regions favorable for prospecting. All these areas, except for the Salinas Valley, contain known oil reserves.

Rocky Mountain area. — Julesburg basin, northwestern Colorado. A study of the Pennsylvanian rocks near Pecos and Albuquerque, N. M., to determine oil possibilities in overlapping beds adjacent to land masses. A contemplated project in northwestern New Mexico and northeastern Arizona to map surface formations and to investigate subsurface data.

Mid-Continent area. — Forest City basin area of Iowa, Kansas, Nebraska and Missouri. Work to be done in cooperation with state geologic surveys. East Colorado and the Salina basin in Kansas; Ellenburger group of North Texas, and Arbuckle Ordovician rocks of Oklahoma and Texas.

Mid-South area. — A contemplated study of occurrence of natural gas in Devonian black shale in eastern Kentucky. No definite plans for this now. Also contemplated is a Lee County, Virginia, project, in an area where small amounts of oil are now produced.

Gulf Coast area.—Comanchean surface and subsurface stratigraphy; preparing a geologic map of Mississippi, in cooperation with the Mississippi Geological Survey. Subsurface studies of the Tuscaloosa and other formations from Louisiana to the Atlantic Coast. This will include studies of the geology of Mississippi, Alabama, Florida, South Georgia.

Appalachian area. — Work is being done on the gas possibilities of the Mississippian rocks in eastern Ohio, in cooperation with the Ohio Geological Survey. Although oil has been produced in Ohio for many years, there is much to be learned about the stratigraphy of Ohio, according to Hugh D. Miser, assistant to Loughlin. The project may be of value in finding gas reserves, and U.S.G.S. believes the potential findings in natural gas exceed the oil potentials in this area. In Tennessee, the survey plans to make subsurface studies of Paleozoic rocks as represented by samples of 300 sets of cuttings from wells widely scattered between the Cumberland coal field and the Mississippi Valley. The Tennessee Geological Survey will cooperate in this project.

Michigan area.—Devonian and older formations will be studied in subsurface areas with the cooperation of the Michigan Geological Survey and the University of Michigan.

Northern Great Plains. — A stratigraphic survey is also contemplated for the area of eastern Montana, North and South Dakota.

Information will be released promptly, through news, press releases, brief papers, etc.

As in the geologic branch, the appropriation has been increased considerably for conservation work and structural studies. Current budget is $805,000, against $569,000 for the last fiscal year.

Projects scheduled by the conservation branch include:

1. Detailed areal and structural mapping of the Elk Basin oil and gas field, Park County, Wyoming, and Carbon County, Montana. Field work is completed.

2. Similar mapping of the Little

Buffalo Basin gas field, Park County, Wyoming. Project now in progress.

3. Structural mapping of the Rattlesnake Buttes gas field, Huerfano, Pueblo and Las Animas counties, Colorado. Field work in this untested, undeveloped area has been completed.

4. Detailed areal and structural mapping of a part of the Horse Center anticline, Park County, Wyoming. Project now is nearing completion.

5. Detailed stratigraphic and structural studies of the Milk River anticline, Glacier County, Montana, on the Blackfeet Indian Reservation. Scheduled for 1944.

6. Stratigraphic and structural studies of the "Disturbed Belt," east of the Rocky Mountain front, in Glacier, Pondera and Teton counties, Montana. Project now under way.

7. Revision and republication of the structure contour map of the Montana plains, by C. E. Dobbin and C. E. Erdmann, published in 1932.

8. Revision and republication of the preliminary structure contour map of the Cut Bank-West Kevin-Border districts, Glacier, Toole and Pondera counties, Montana, initially published in 1939.

9. Detailed surface and subsurface study of natural gas occurrence in Bowdoin dome, in Phillips and Valley counties, Montana. This is scheduled for 1944.

The operations of the conservation branch will be expanded considerably in the near future, with a realignment of field offices, and increased activity in conservation studies aimed at increasing production in operating fields, located on public or Indian lands.

An additional U.S.G.S. project of interest to oil producers is one done in cooperation with PAW and the Bureau of Mines, in which tar sands in California and elsewhere will be studied with the objective of using them to produce wartime fuel. A project in Oklahoma will, it is hoped, lead to further discoveries of tar-sand deposits.

Midwest Refiners Ask Removal of Freight-Reimbursement Limitations

WASHINGTON, D. C. — A request that the Government's payment of excess transportation costs of crude petroleum in District 2 be broadened to cover all movements supplementing pipe lines was made by a group of about 50 refiners from that area meeting last week with officials of the Defense Supplies Corp., and with Fred M. Vinson, director of economic stabilization.

The present policy of DSC is to pay the difference above pipe-line costs only on rail hauls of crude from West Texas to those District 2 refiners not in the excess-profits-tax bracket. The refiners asked that the discrimination as to tax brackets be removed and the compensation policy be applied to all abnormal shipments of crude, whether by rail or barge, and from East Texas, Wyoming, or any other source of supply.

Following the visit the group prepared a brief on the subject, but the officials did not indicate what the decision may be. DSC has withheld publication of its regulations for compensating West Texas tank-car shipments pending consideration of the new request.

The refiners also spent considerable time discussing the District 2 crude shortage with various officials of the Petroleum Administration for War. Virtually every possible means of obtaining additional crude was explored, but no positive or complete solution was found.

Very few additional tank cars will be available for crude movements, the refiners were told, and it will be impossible to divert much, if any, crude from the big inch and other pipe lines serving the East Coast because of the necessity for keeping war-products refineries operating at maximum capacity. While considerable idle refining capacity exists in District 2, PAW will not countenance diversion of crude to District 2 if this would involve reduction in the war products output of refineries in Districts 1 or 3. Rearrangement of tank-car shipping schedules may make it possible for some Mid-Continent refiners to obtain some additional crude from District 3, but this is not expected to be sufficient to permit all District 2 refineries to operate at capacity.

Sunniland Well in Florida Pumping 77.37 Bbl. Daily

TALLAHASSEE, Fla.—An average of 77.37 bbl. of oil daily has been produced by Humble Oil & Refining Co.'s discovery well at Sunniland during the first week of a state-inspected test, Herman Gunter, state geologist, reported. A 30-day production test is being made to ascertain whether the well will qualify for the reward of $50,000 and oil leases on 40,000 acres of land offered by the state for the first commercial oil producer in Florida.

Gunter's report, made to Attorney General Tom Watson, of the state cabinet oil committee, said the oil was separated from a mixture of fluid in which the salt-water content varied from 83.7 per cent to 88 per cent of the total production.

The level of the fluid in the 11,000-ft. hole on the edge of the Everglades varied from 2,461 to 3,089 ft. below the surface. The pumps were operated at speeds ranging from 14 to 23 s.p.m. At 14 strokes, they brought up oil at the rate of about 64 bbl. a day, at 23 strokes about 111 bbl.

Repressuring of Magnolia Field Is Decided Upon

SHREVEPORT, La. — Repressuring of the present producing formation of the Magnolia field, Columbia County, Arkansas, will begin as soon as details of a plan tentatively agreed upon can be put into operation. The plan, adopted here last week at a meeting of the Magnolia Operators Committee on Pressure Maintenance and Salt Water Disposal and the Arkansas Oil and Gas Commission, provides for the operation of the pressure-maintenance system and water reinjection by one of the operating companies with production in the field.

Cost of the operations would be borne jointly by all operators in the field on the basis of acre feet saturation each holds in the proven area. The Arkansas Oil and Gas Commission has approved the plan.

L. L. Jordan, chief engineer of the Arkansas commission, and heading the commission staff at the meeting, told the operators the commission was interested in recovery problems and repressuring operations. He said it was the aim of the commission to aid operators in conserving and producing in every field in the state and that by such plans as they were making for the Magnolia field the ultimate recovery would be greatly enlarged.

Shell Buys Tolliver Lease From General American

DALLAS, Tex.—Shell Oil Co., Inc., has purchased the Tolliver lease in the East Texas field from General American Oil Co. for a reported consideration of $208,000 cash. The property, in the Joiner district of Rusk County, consists of four producing wells on 17.33 acres of land. Purchase of the rest of General American's properties in the field, comprising 22 leases and 183 producing wells, was said to be under consideration.

W. C. Wenzel Appointed Penn Grade Secretary

WILLIAM C. WENZEL has been named general secretary of the Pennsylvania Grade Crude Oil Association. Wenzel will take over his new duties at the association's executive offices in Oil City, Pa., immediately. He succeeds S. F. Pratt, who resigned at the end of last year to join Union Trading Co., Inc., New York.

Since early in 1942, Wenzel has been executive secretary of the Extra

WILLIAM C. WENZEL

Transportation Expense Managing Subcommittee of the PAW Transportation Committee of District 1. Prior to his association with this committee, he was for 8 years in the executive offices of Dun & Bradstreet, Inc., New York, serving as manager of their petroleum division. His earlier experience includes service with Richfield Oil Corp., where he was assistant treasurer, and with Crucible Steel Co.

He is native of Newburgh, N. Y., is married and has three children. The Pennsylvania Grade Crude Oil Association, the president of which is D. T. Andrus of Bradford, Pa., is 21 years old.

Record Deposits Shown by National Bank of Tulsa

Decreased credit needs of the oil industry, a result of curtailed drilling and plant-expansion operations, were reported in the annual statement issued last week by the National Bank of Tulsa which ended 1943 with deposits exceeding $100,000,000.

Bank investments in government securities were nearly doubled to a year-end total of $53,783,726, according to the report submitted by A. E. Bradshaw, president. Deposits totaled $100,687,222, an increase of 20 per cent over the previous year.

Net earnings from operations, after provision for income taxes, normal depreciation and dividends on preferred stock, amounted to $532,496.16. Other income raised the net additions to undivided profits to $594,828.

Ration banking covering gasoline and fuel oil in addition to foodstuffs created the necessity for opening 491 accounts. There were 27,529 vouchers charged to ration accounts, indicating scope of the work created by wartime services.

DEATHS

Dr. George Otis Smith, 72, for many years director of U. S. Geological Survey, died January 10 in Augusta, Me. Dr. Smith, active in development of oil, power and water resources, was instrumental in the enactment of oil, land, and mineral leasing laws. He was at one time chairman of the Naval Oil Reserve Commission.

Claude L. Freeland, discoverer of the Bristow oil pool, died in Bristow, Okla., January 11. He was associated with his father, the late F. S. Freeland, in oil operations in the Mannington, W. Va., area from 1900 to 1904. In 1907 he and Frank Barnes, of Tulsa, drilled the first well in the Bristow area, launching a drilling campaign never fully halted. In 1909 he opened the Bristow gas area, and organized the Bristow Gas Co. to pipe gas into the city. In 1918 Freeland and the late A. A. Rollestone formed Roland Oil Co. and in 1921 they opened what now is called the Continental pool.

George C. Brown, 67, for 24 years cost engineer for Sinclair Refining Co., died recently at his home in Houston, Tex.

W. R. Bruce, who died recently in Columbus, Ohio, was sales manager for the old International Refining Co. and later engaged in the oil and gasoline brokerage business in Tulsa. He was one of the founders and the first secretary of the Petroleum Club, now the Tulsa Club.

Victor A. Ogilvie, director and assistant treasurer of Gas Advisers, Inc., died at his home in Ridgewood, N. J., on January 9. He had been connected with the Cities Service Co. system 25 years, beginning upon graduation from Iowa State College in 1917 as an engineer with Denver Gas & Electric Light Co. in Denver, Colo. For the past 13 years Ogilvie had been located in New York doing work relating to all phases of gas engineering for natural gas and natural-gasoline properties.

Arthur Kendall, president of Bata Oils, and for several years prominent in Saskatchewan wildcatting operations, died at Regina, Sask., recently.

G. Harvey Rumohr, 29, of Sarnia, Ont., employed by Tropical Oil Co. at its refinery at Barranca-Bermeja, Colombia, died January 8 from wounds inflicted by a discharged worker.

William Edward Henderson, 58, production manager for International Petroleum Co. in Peru for 15 years, 1924 to 1939, and earlier and subsequently an oil producer in the Petrolia field, died recently at Petrolia, Ont.

B. F. Hill, 28, refinery worker for Shell Oil Co., Inc., was drowned January 12 when he fell from an oil barge into the Ship Channel at Houston, Tex.

E. O. Rhodes, 59, oil producer and geologist, died January 13 at his home in Tulsa. He was vice president of Gaskill Oil Corp. when he retired in January 1943.

A. E. (Andy) Thompson, 55, who was general superintendent of Standard Oil Co. (Indiana) refinery at Casper, Wyo., from 1931 until his retirement in 1936, died at that city. He was a native of Norway, and began his career with Standard of Indiana at Whiting, Ind., in 1903.

Henry Smith, 65, retired employe of Sinclair Refining Co., died January 13 in Pasadena, Tex.

Calvin H. Carpenter, 71, production superintendent for The Texas Co. in Tulsa when he retired in 1936, died January 13. He had been in the company's service 29 years.

Tony Byron, 56, who died January 5 in Bowling Green, Ohio, grew up in the oil fields of Wood County, that state, where his father was an oilfield worker. He was sent to Yening Young, Burma, as a superintendent for Royal Dutch-Shell, and was there during the first World War, serving altogether 12 years in that country.

John D. Matteson, Sr., 49, delivery gager for The Texas Co., died January 12 in Houston, Tex.

William C. Richards, 68, independent oil producer, died January 4 in Elmore, Ohio. Richards, a Spanish-American War veteran, had spent his adult life in the North Lima oil field.

Factors Involved in Design Of Long Strings of Casing

*by H. M. Cooley**

Collapse resistance, joint strength, internal-pressure resistance, biaxial stress effects, stretching of casing due to its weight when suspended, the effect of temperature change on length, and the effect of column loading on strings in compression are some of the properties of steel casing which require critical examination in casing-string design, this author asserts

WHEN a hole is drilled in the earth to an oil-bearing stratum, it penetrates a number of different formations which react in various ways to upset the oil producer's plans. Some of the formations disintegrate rapidly, filling the hole with cavings and leaving large cavities which would not serve well as channels through which oil could pass upward. Others contain water which would flow down the hole and drown out the oil. Others contain gas under high pressure. Others are porous and oil rising from a lower formation would penetrate the upper one in sizable quantities. These and other considerations make it necessary to run steel casing in a well. No other way has been devised to maintain the hole in the ground in a condition suitable to permit production of oil.

Requirements for Long Casing Strings

The stresses encountered and developed in casing strings in fulfilling the purposes and functions already mentioned are sometimes of an important magnitude, particularly in long strings. The engineer responsible for design and selection of the elements of the strings in such cases must give careful consideration to the various properties of the material, and to the possible unusual or abnormal field conditions that may be found. He must then decide upon safety factors for the various properties and proceed to select by calculation the casing string which will properly perform the required functions with the least cost that is practicable.

Some of the properties of steel casing which require critical examination in casing string design are collapse resistance, joint strength, internal-pressure resistance, biaxial stress effects, stretching of casing due to its weight when suspended, the effect of temperature change on length and the effect of column loading on strings in compression. It can be hoped only to present a practical approach to each of these properties, and to suggest a simple method of handling them. Each of the properties will be examined separately.

*Manager of field engineering, Bethlehem Steel Corp., Tulsa. Presented at meeting of Petroleum Engineers Club, Fort Worth, Tex.

Collapse Resistance

Collapse resistance is by far the most important property of casing. It is this property which makes it possible for casing to prevent most of the undesirable conditions which the various formations produce. In short, it makes it possible for casing to case out undesirable material and to case in desirable material in an oil well.

The collapse resistance of casing has been properly studied to a greater degree of thoroughness than any other property. Data covering experience of many years has been collected and studied, and specific conclusions have been drawn. Dependable tables of collapse resistance are available for all of the standard casing sizes and weights and grades. American Petroleum Institute Code 5-C-2, "Setting Depth Properties of Casing," lists the minimum collapse resistance in pounds per square inch for all standard sizes, weights and grades of casing. A common practice among oil-company engineers, for "normal" conditions, is to apply a safety factor of 1.125 to these figures. Many of them give full consideration to the weight of drilling fluid which, in many cases, is retained outside the casing above the cement, and provides the collapsing pressure. Many of the engineers give consideration in strings of more than one grade or weight (combination strings) to the possible effect of tension stresses on collapse resistance, and, by various methods, arrive at a higher safety factor for the bottom portion of the upper section or sections. Tables published by various manufacturers usually list the A.P.I. properties, calculated to feet of depth, using a safety factor of 1.125 and a collapsing medium of 1.155 specific gravity, and do not include mud-weight corrections or effect of tension.

Joint Strength

When a string of casing is suspended in an oil well, the weight of the entire string is supported by the top joint. The threads and the couplings which make up the joint must be of sufficient strength to resist parting by fracturing or by stripping and must also resist leakage under stress. A.P.I. Code 5-C-2 lists minimum joint strength in pounds for standard casing, and also lists the joint strength calculated to feet of casing which will provide the equivalent weight. Safety factors to be applied to these figures vary among various oil-company engineers, and depend upon many field considerations such as the buoyancy of drilling fluid, height of cement, and completion practices. Some engineers use

SUCCESSIVE STEPS IN RUNNING SECTION

Awaiting another section

Removing thread protector on next section

Stabbing additional section

safety factors as low as 1.6, others use 2.0. A great many operators use 1.8 for "normal" conditions and vary the factor in either direction only when special conditions arise.

Internal Pressure Resistance

Oil and gas may exist in porous strata under high pressures, usually not over ½ lb. per ft. of depth. Occasionally, however, abnormal conditions have been encountered where pressures may reach 1 lb. per ft. of depth. This pressure, inside the casing, is offset at the bottom of the string by the external pressure of the column of drilling fluid and by the cement which was placed there when the string was run. At the top of the string, however, the casing itself must resist the internal pressure, and in recent years, this has become one of the important considerations in deep-well casing design. The A.P.I. code lists the minimum internal yield pressures for the standard grades, and many engineers use these figures with no safety factor (that is, with safety factor of 1).

Effect of Tension Stresses on Collapse Resistance

The effect of tension stresses on collapse resistance has received only a limited amount of study, and conclusions therefore are varied. Many oil operators give no consideration to this phase of casing design, and have postponed action until such time as adequate data are available to support a conclusion. Others make only a nominal or arbitrary correction for such effect, adding a little to the safety factor used at the critical intermediate junctions of two sections of combination strings. Others calculate the effect, using one of several theories which cover failure of material under combined stresses. The A.P.I. has not included in its codes the question of combined stresses, nor any suggestion as to a proper solution of the problem resulting from use of combination strings of casing in deep wells. An excellent presentation of the problem appears in A.P.I. "Drilling and Production Practice," page 125 (1940).

Stretch of Casing When Suspended

When it is desired to set casing at an exact depth, it becomes necessary, especially in long strings, to consider several factors which will change the length of the string with respect to the measured length of the various pieces as they lie on the casing rack. One of the most important is the effect of the weight of the string itself. It is known that the unit stress applied to steel, divided by the unit strain or stretch is a constant up to the elastic limit, and from this fact the stretch or increased length can be calculated. Tables and curves are available which simplify the determination of this factor and which take into consideration the effect of various buoyant fluids which would reduce magnitude of stretch.

Effect of Temperature Change on Length

Another factor to be considered with respect to the length of a casing string is the effect of temperature change. Casing measured on a casing rack in the summer time will shorten when run in a well where the average temperature is lower, and similarly, allowance in the reverse direction should be made when casing is measured in very cold weather. The unit expansion or contraction for casing steel is about .000007 per degree Fahrenheit.

Column Loading

Some of the formations penetrated in drilling do not stand up rigidly. They may dissolve, or slough off and leave large cavities at various depths. When these occur far down the hole in deep wells, the weight of the casing above a cavity may be sufficient to buckle or collapse the casing if it is, either inadvertently or intentionally, set down on bottom. The critical loads bringing about buckling in casing columns can be calculated using standard column formulas, as follows:

Collapse Formulas

(a) For all of the usually encountered D/t values. Collapsing pressure

$$P = YP\left(\frac{2.503}{D/t} - .046\right)$$

OF LONG STRING OF 5½-IN. O.D. CASING

Spinning in section

Tonging (tightening section with tongs)

Removing slips to lower casing

(b) For values of D/t of less than about 14. Collapsing pressure

$$P = \frac{2YP\,(D/t - 1)}{(D/t)2}$$

(c) For values of D/t above the highest value for plastic failure. Collapsing pressure

$$P = \frac{62.6 \times 10^6}{D/t\,(D/t - 1)^2}$$

Formula (a) is of the same form as the original Stewart formula and has been accepted by the A.P.I. Committee on Standardization of Oil Country Tubular Goods. It was derived by using the values of available collapsing pressure tests and then determining what formula and curve best fit the values.

Formula (b) applies to small-diameter heavy-wall pipe. It is Lame's equation, and was accepted by the A.P.I. committee as giving a reasonable theoretical solution which would serve until adequate data were available for the range of D/t values of less than 14.

Formula (c) was derived from the theoretical elastic curve equation which represents the upper boundary of available test results. Formula (c) gives results of about 95 per cent of the theoretical values.

These collapse formulas and curves are predicated upon the physical properties of the various grades and upon the dimensional characteristics of the casing. As is the case with all engineering design, engineers must use formulas, whether empirical or theoretical, in the light of experience and engineering judgment based upon the individual conditions which surround each problem. Therefore, these design formulas are used with safety factors which are now quite well established in the several fields as a result of broad engineering experience.

In past years these safety factors were frequently based on the average physical properties of a particular grade of casing. On the other hand in other engineering calculations it has been more general to employ the minimum specified physical properties of a given engineering material and establish safety factors on that basis. The latter method would appear the more rational inasmuch as specifications should properly be, and customarily are established on minimum values.

In the case where reliable test data are available, as is true for the established grades of A.P.I. casing, a change in design calculation systems from one based upon average values for a given grade to that based on the minimum specified properties of that grade can easily and confidently be effected. For example, A.P.I. committee in preparing Code 5-C-2 has established that the minimum collapsing strength represents 75 per cent of average collapsing strength. On this basis where a safety factor of 2 had been employed, with average values, a factor of 1½ would result in the same design when minimum values are used. Actual physical test values and collapse test values are the basis of Code 5-C-2 which therefore can be

Filling up with mud after lowering section

used as a rational design procedure based on minimum specified properties for the several grades of casing.

Formulas for Joint Strength

The A.P.I. pipe committee has adopted, after many discussions and long study, formulas for joint strength of casing. For short couplings the formula follows:

$$P = C\,(33.71 - D)\left(\frac{1}{t - .07125} + 24.45\right) A,$$

where C is a constant, varying with the grade of steel, and A is the area of metal under the thread. For long couplings a larger C value is used, and the 33.71 figure is replaced by 25.58. The resulting joint strength figures are average figures and are closely in accord with the average of the test data which are available. A careful study of the data resulted in the adoption for use in the setting depth property code of minimum values of 80 per cent of the average values obtained by use of the formulas. The same comments suggested for the use of minimum values for collapse strength apply also to joint strength.

Formula for Internal Pressure

The accepted formula in the A.P.I. Code of Internal Pressure calculations is Barlow's formula, using the minimum specified yield strength for the stress in the steel, and a factor of 87½ per cent has been agreed upon in arriving at the minimum value.

Formulas for Effect of Tension Stresses on Collapse Resistance

Sufficient data are not available to determine exactly what the final relation between tension stresses and collapse resistance will be. However, results of tests made by Edwards and Miller have been considered in a paper by Wescott, Dunlop and Kenler (A.P.I. Dr. & Prod. Practice 1940) and have been found to fit reasonably well one of the principal theories of the behavior of material under combined stress. This theory, called the maximum strain-energy theory, has been developed by these authors into three simple curves, one for each of the casing grades, and showing the lowered percentages of normal collapsing pressures for various tension stresses, which are expressed in terms of casing length below the critical point where grade or weight changes occur.

Application of Design Conclusions to Casing-Selection Charts

After the various safety factors and other fundamentals have been decided upon, the engineer can proceed to develop the elements of the casing string for the depth under consideration. If it is desired, the resulting combination string can be plotted on graph paper, and the points can be calculated for other depths and casing selection charts can be prepared, which can serve as a guide in selecting casing strings. Another important use of the charts is to assist field personnel in running casing. Such charts are readily available from various sources. A typical chart for 5½-in. o.d. casing that can be obtained after safety factors and other considerations have been determined, is shown in Fig. 1.

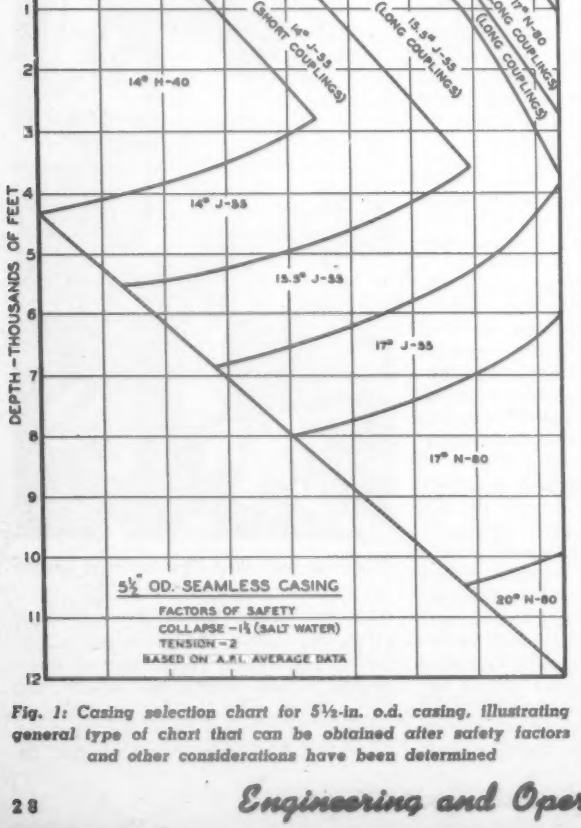


Fig. 1: Casing selection chart for 5½-in. o.d. casing, illustrating general type of chart that can be obtained after safety factors and other considerations have been determined

It seems advisable at this point to mention the desirability of using casing strings composed of several sections, differing in weight or grade (or both) from each other. Obviously, casing of greater collapse strength is required for the bottom of the string where collapse stresses are greatest, and casing of greater tensile or joint strength is needed at the top where tensile stresses are greatest. It is generally believed that sufficient experience has been had with combination strings to justify an extension of their use. Just last month at a meeting of the A.P.I. committee the following resolution was adopted: "In the interest of conserving both material and manufacturing capacity for the benefit of the war effort, it is recommended that the main pipe committee urge all operators to review their casing program designs to assure that the most economical combination of A.P.I. standard weights and grades be utilized."

Conclusion

The question of safety factors is the most important one that an oil-company engineer will encounter in designing casing strings. In selecting these he will draw conclusions from his own and his company's experience, and from the experience of other companies operating in the same area and under the same general field conditions. Type of formation and pressure to be encountered will influence the selection. Depth and cost of well also will have some bearing on the safety factor question. The risk involved in using low safety factors in a casing string for an 800-ft. well at Nowata, Okla., is quite apart from the risk, which no one would probably take, in using low safety factors in a 10,000-ft. well in the Kermit, Tex., area, where one well might cost as much as a Flying Fortress.

Two Papers on Rocky Mountain Area Reviewed

John R. Fanshawe, II, of Petroleum Administration for War, Denver, Colo., has prepared reviews of two recent papers which he describes as a complete and important summary of information on Rocky Mountain petroleum geology. The papers are "Structural Conditions of Oil and Gas Accumulation in Rocky Mountain Region of the United States," by C. E. Dobbin, which appeared in the April 1943 issue of A.A.P.G. Bulletin, and "Occurrences and Types of Crude Oils in Rocky Mountain Region," by J. C. Crawford and R. M. Larsen, which appeared in the October 1943 issue of the A.A.P.G. Bulletin. According to Fanshawe, the newcomer to Rocky Mountain problems will find answers to many of his questions in these two papers, and the old hand in the region will find new food for thought in the compilations themselves and in the way they are presented.

ASPHALTIZATION TESTS

For Lubricating Oil

*by J. Faust**

Two types of oil have been found by these investigators, in searching for means of identifying good diesel engine lubricating oils. One type of oil forms hard granular carbon which does not dissolve in the oil and the viscosity of which increases slowly. The other cementizes the carbon so formed in the oil without much precipitation and asphaltizes or solidifies much more rapidly. The result of the test, given in hours before incipient solidification, is called the asphaltization index of the oil. This article is printed to stimulate discussion and experiment and comment is invited.

IN the course of a study of oxidation characteristics of lubricating oils we have observed that when certain lubricating oils are subjected to intensive oxidation under certain conditions they tend to lose their fluidity and ultimately become converted to a solid, asphalt-like material. The time required for such transition, which we call asphaltization, varies with the type of oil, and on the basis of observations of the behavior of a wide selection of lubricating oils when subjected to oxidizing conditions designed to produce asphaltization, we have been able to establish two categories of oils from the standpoint of their susceptibility to this phenomenon, viz:

1. Rapidly asphaltizing lube oils.— In this category are the conventional Pennsylvania oils, represented by blends of bright stock (residual oils) with neutrals (overhead distillates). Such blends exhibit a drastic increase in viscosity and tend to form oil-soluble sludge when subjected to the oxidizing conditions obtained throughout the asphaltization cycle.

2. Nonasphaltizing lubes. — In this category are the overhead distillates and some of the Mid-Continent oils. These retain their fluidity but tend to form an oil-insoluble, hard granular sludge.

The mechanism by which the concomitant formation of these two types of sludges results in the ultimate asphaltization of oils in which they are generated by oxidative conditions is as follows:

In lubricating-oil blends of bright stock and neutrals, the oil-soluble sludge, which is formed from the bright stock, "glues" or cements together the hard carbonaceous sludge formed from the neutral, thereby preventing it from precipitating out of the oil. It is the "cementized" composite sludge which is the factor which is primarily responsible for asphaltization. Furthermore, this mechanism is accelerated by the presence of metallic soaps, whether introduced a priori, possibly as an additive, or formed in situ as a result of the action of the acidic product of oxidation of the oil upon the metallic surfaces typical of modern bearing metals and alloys. That the extent of this acceleration varies with the type of metal present will also be seen later in this article.

Striking corroboration of this theory of asphaltization is found in the explanations advanced by Treiber,[1] Rosen[2,3] and others[4,5] on the causes of piston ring sticking in diesel oils. For it is precisely the parallelism of the behavior of an oil in a diesel engine, to its behavior under the conditions which lead to asphaltization of an oil under intense oxidative conditions that reflects the validity of our concept of asphaltization and the value of the test which we have developed for measuring this tendency.

Asphaltization Tests for Lubricating Oil

O. D. Treiber[1] has pointed out that: "The fuel is injected into a diesel engine at a pressure and temperature well above the cracking range. This produces an abundance of free, colloidal carbon. . . . This carbon will not stick together any more than a quantity of sand. It requires a binder or some 'cement' to become a factor in sticking any parts together. The cement can also come from lubricating oil and the diesel engine forms more of this cement from lubricating oil than gasoline engines due to higher compression temperature and the unquestionably high blowby."

H. Rosen[2] cites the fact that: "The blowby gases in a diesel engine are over 90 per cent pure air and, therefore, provide one of the best oxidizing apparatus available" for a lubricant.

The object of this article is to present a standardized procedure designed to induce the asphaltization of lubricating oil and to provide a numerical basis for differentiating lubricating oils from the standpoint of their susceptibility to asphaltization. As will be seen further, the procedure is adequate for establishing the correlation between tendency to asphaltization and other, more familiar, characteristics such as color, viscosity, etc. It is our opinion that the procedure permits the prediction of the behavior of an oil under the oxidizing conditions prevailing in the diesel engine itself.

Operating Conditions of the Asphaltization Test

The asphaltization test is carried out conveniently in the standard Indiana oxidation apparatus, modified only by the introduction of metals; the temperature of the apparatus and the flow of air passing through it are maintained at respectively 341° F. and 10 l. per hour.

The presence of the metals is resorted to, as is already mentioned for their accelerating action. However, we have found that not all metals accelerate asphaltization to the same degree.

The difference in the accelerating

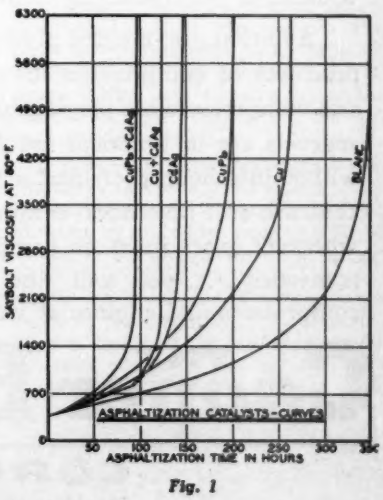


Fig. 1

*L. Sonneborn Sons., Inc.

1953 *Business Runabout*

TURN the calendar forward. Picture yourself in your own backyard . . . taking off for the office a hundred miles away. Your streamlined helicopter rises, makes the run in an hour. It descends vertically, quickly, to your parking space. It solves the congested highway problem by soaring above it.

This transportation wonder is in production for the army. In post-war days it may be built of molded plywood and plastics. It will be driven by a powerful motor made largely of magnesium, smaller and lighter than today's auto engine . . . a diesel or one fueled by high octane gasoline.

Aviation gas, molded plywood, plastics, magnesium . . . all products of compression in which Cooper-Bessemer engines and compressors are playing such a vital part. These synthetic marvels are in practical use for war today. Tomorrow they will go into helicopters and a hundred other miracle products that are still inventors' dreams. And in their production . . . wherever gases must be handled . . . where economical power is needed . . . you will find dependable Cooper-Bessemer compressors and engines at work.

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action of various metals and alloys (singly and in combination) may be seen from Fig. 1 in which the asphaltization time in hours of a conventional Pennsylvania S.A.E. 20 oil was plotted against per cent viscosity increase. Steel or iron, for example, hardly affected the asphaltization rate of the oil; copper, however, was found to accelerate the asphaltization of the oil to a considerable degree. CuPb, CdAg and combinations of CdAg with Cu or with CuPb were found to have a still greater accelerating effect, cutting down the asphaltization time of the oil to a very considerable degree. This is illustrated by Table 1.

TABLE 1—ASPHALTIZATION TIME IN HOURS

Blank sample (no metals):	
A convention Pennsylvania Motor oil S.A.E. 20	360
Same oil, metals present:	
Steel	350
Cu	260
CuPb	210
CdAg	140
Cu plus CdAg	120
CuPb plus CdAg	96

For the standardized laboratory asphaltization test, CdAg bearings were found to give the most satisfactory results as regards accuracy and reproducibility. The CdAg bearings used are of the type used in commercial automotive engines, since our object was also to conduct the test under conditions closely approximating actual conditions of service.

Evaluation of Asphaltization Tendency of Lubricating Oils

Viscosity increase was found to be the best criterion for following the changes and over-all deterioration any oil undergoes when subjected to the asphaltization test. Other methods, such as, naphtha-insoluble determinations, acid numbers, saponification numbers, carbon test, ash content, spot test and loss of weight due to corrosion were found unsuitable for evaluation of asphaltization.

Naphtha-insoluble determinations, for example, gave misleading results, because the sludge yielded by rapidly asphalting oils was difficult to filter and the values obtained for the naphtha-insoluble sludges were small and insignificant. The measurement of loss of weight of the metallic bearings due to corrosion yielded somewhat better results but was found unreliable, since the metallic bearings were often completely denuded of their alloy layer long before the oil was asphaltized.

The correlation of increases of viscosity (i.e., loss of fluidity) of the oil and asphaltization tendency is illustrated by the data given in Table 2, in which the viscosities are given as Saybolt seconds at 80° F.

TABLE 2

Time of test in hours	Saybolt viscosity at 80° F. of an S.A.E. 20 Pennsylvania oil tested with CdAg bearings
24	565 seconds
48	675 seconds
72	1,050 seconds
96	1,900 seconds
120	4,550 seconds
140	barely moving
168	solid

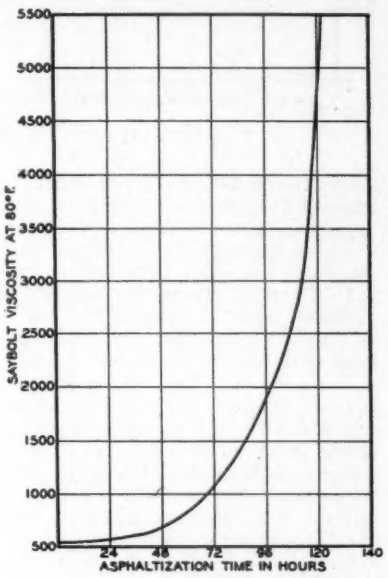


Fig. 2

The above results as plotted in Fig. 2 show that the critical point at which the oil acquires a sudden, extraordinary increase in viscosity occurs after about 120 hours. The oil at this point, while gel-like, still possesses some mobility; after 140 hours mobility is nearly gone; and it then changes to a semisolid, plastic asphalt.

The time at which the oil barely moves is recorded as the asphaltization time in hours or the asphaltization index of the oil.

Viscosity can also de determined in the Saybolt viscosimeter at 210° F.; for routine purposes, however, it is sufficient to examine the fluidity of the oil at definite intervals of time, as will be described below.

Procedure.—The 400 cc. of the oil is introduced into a standard I.O.T. tube and a section of standard CdAg bearing (Part 19-229) about 1½ in. wide and 3 in. long is suspended in the oil, on an iron or steel wire. These bearing sections should be cleaned preferably with a rubber eraser and not with emery paper since scratches or any mechanical damages to the surface were found to affect the reproducibility of results. The steel back of the bearing, however, may be cleaned with emery paper.

When the oil has reached a temperature of 341° F., air is blown through it at a rate of 10 l. per hour. Maintenance of a constant temperature and air supply is, of course, essential in assuring accuracy of results. At definite intervals a small sample of the oil is taken out (about 5 cc.) and transferred into a regular test tube. When the oil has cooled to room temperature, the test tube is placed into a water bath maintained at 80° F. and after about 15 minutes is taken out and tested for fluidity by turning the test tube upside down. If the oil is still fluid, the test is continued. When the oil is barely moving, the test is continued for another 8 or 16 hours and then tested again. When the oil is found nonfluid, the test is discontinued.

The results obtained with two Pennsylvania oils—one (Oil No. 1) a conventionally refined, the other (Oil No. 2) a specially refined oil which has the Caterpillar approval—are given in Table 3. To show the reproducibility of the asphaltization test, both oils were run in quadruplicate.

TABLE 3—ASPHALTIZATION INDEX IN HOURS

	(a)	(b)	(c)	(d)	Avg.
Oil No. 1	120	128	128	120	124
Oil No. 2	340	348	348	350	346.5

Above figures show that the results of the asphaltization test check within 6 per cent. At the same time they point to the correlation between the results obtained in the asphaltization test and the Caterpillar diesel-engine test. Since the oil which passed satisfactorily the Caterpillar test had an A.I. of about 345 hours, it appeared reasonable to establish the asphaltization test for a maximum period of 400 hours.

Factors Influencing Asphaltization of Lubricating Oils

An attempt has been made to correlate the asphaltization tendency of lubricants with some of their characteristics, such as type, composition, physical properties, manufacturing methods, additives present, etc. Of interest was first to investigate the effect of initial viscosity on the A.I. of lubricating oils.

1. Effect of initial viscosity.—Preliminary tests conducted with a series of conventional Pennsylvania oils, varying in viscosity from S.A.E. 10 to S.A.E. 70 have shown that the asphaltization tendency of a lubricant varies with its initial viscosity. A series of oils from S.A.E. 10 to S.A.E. 70 was prepared by blending a 180-viscosity Pennsylvania neutral and bright stock.

These oils were then subjected to the asphaltization test and the results obtained are given in Table 4. Note: Included in same table are the ratios

in which these oils were blended and the Saybolt viscosities of these blends at 210° F.

Above results indicate that initial viscosity is definitely related to the asphaltizing tendency and that the higher the viscosity, the higher (the better) the asphaltization index of the oil. The A.I. appears to reach its maximum with an S.A.E. 40, remaining practically constant with higher viscosity oils.

A striking exception, of course, is S.A.E. 10, its asphaltization time being over 400 hours. This is because this oil is an overhead distillate, which, as stated in the introduction, forms only a granular, precipitable sludge not so greatly affecting the viscosity of the oil. The other oils, however, which are composed of overhead distillate and residual oils, form both types of sludges, the granular and glue-like, the latter cementizing the former and remaining in solution in the oil. This cementizing combination of both types of sludges remaining in the oil causes the solidification of the oil. The worst possible conditions for this phenomenon exist in an S.A.E. 20 oil and is evidenced by its lowest A.I. The results obtained are shown in Fig. 3 by the curve on the left side. This curve is obtained by plotting the ratio of bright stock used in preparing the various S.A.E. grades against the asphaltization indices in hours.

Note: The curve on the right side of Fig. 2 refers to an ideal curve which we would obtain presumably were all possible combinations of bright stock and neutral tried out in a ratio from 99 neutral to 1 bright stock up to a ratio of 1 part neutral to 99 parts bright stock.

2. Effect of color.—This study was carried out on a series of samples of a basic Pennsylvania HD oil filtered to different colors ranging from 1R to 6.5R (Lovibond colorimeter ½-in. cell). The specification properties of these oils together with asphaltization indices are given in Table 5.

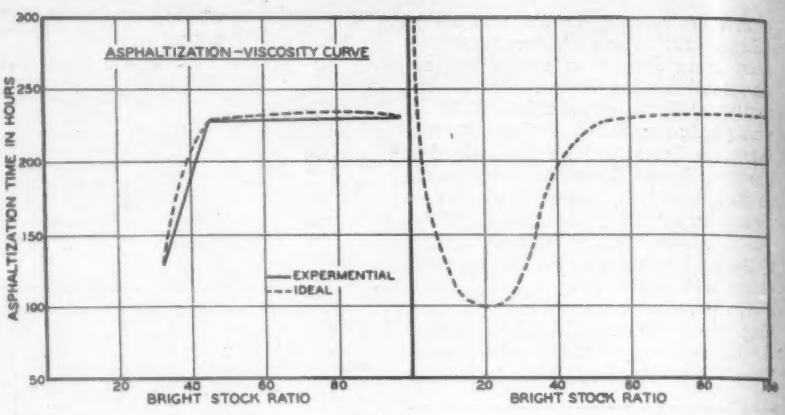


Fig. 3

Above results seem to indicate that the color has some influence on the A.I. of the oil. There is, however, a "critical point" corresponding to a certain color—in this particular case apparently 4R—at which the optimum A.I. is obtained. The reason for this may be that the filtration to which oils are subjected as their final refining step removes two types of compounds, both most probably of aromatic character; one which acts as a natural asphaltization inhibitor, and the other as natural asphaltization accelerator. As long as the first predominate, which is possibly the case when the oil is overfiltered or when the filter material is exhausted, the A.I. is low. When, however, the natural inhibitors predominate, the A.I. improves. More research seems necessary to corroborate this assumption.

3. Effect of manufacturing methods.—From the data obtained in the course of this investigation, it is not unreasonable to conclude that any process tending to remove a certain type of hydrocarbons from a basic Pennsylvania HD oil will produce an oil of high A.I. Thus, solvent extraction or acid treatment would seem feasible as methods of producing a nonasphaltizing HD oil; the latter, for example, yielded the following results with two acid-treated cylinder oils blended with 180 neutral to an S.A.E. 20 viscosity oil. The ratio in which these oils were blended, together with their specification properties and A.I.'s, are given in Table 6. A conventionally refinery Pennsylvania basic HD of S.A.E. 20 is included for comparison:

TABLE 4

Per cent 180N	Per cent bright stock	S.A.E. No.	Saybolt viscosity at 210° F. of blend (seconds)	Asphaltization index of blend (hours)
100	..	10	48	more than 400
68	32	20	58	128
60	40	30	64	180
55	45	40	75	224
33	67	50	86	228
12	88	60	118	228
5	95	70	136	230

TABLE 5—INFLUENCE OF COLOR ON A.I. OF A BASIC CONVENTIONALLY REFINED HD PENNSYLVANIA OIL OF S.A.E. 20

Color (Lovibond ½-in. cell)—	1R	2R	3R	4R	5R	6.5R
Specific gravity	31.2	30.8	30.0	29.5	29.3	29.0
Saybolt viscosity at 100° F.	302	322	342	361	366	372
Saybolt viscosity at 210° F.	55	56	57	58	58.5	58.5
Flash, °F.	425	425	425	425	425	425
Fire, °F.	475	475	475	475	475	475
Pour point, °F.	+35	+35	+35	+35	+35	+35
Carbon test, per cent	0.15	0.2	0.29	0.34	0.38	0.47
Viscosity index	114	112	111	110	110	109
Asphaltization index-hours	168	168	180	336	172	192

Nonasphaltizing Oils

The term "nonasphaltizing oils" is to be construed in a relative sense only, as a designation for oils found to withstand the operating conditions of the asphaltization test for more than 400 hours. The period of 400 hours was adopted as the limit because subjecting the oil to longer periods of catalytic oxidation would deteriorate it beyond the point of any practical consideration.

In this class we find two types of oils, one in which the high A.I. is due to the presence of an inhibitor, the other in which the high A.I. is attributable to type or composition. However, not all oils belonging in the class of "inhibited oils" show the same behavior. (In view of this observation, a detailed study of the influence of various additives on rate of asphaltization would seem to be in order.) Examination after 400 hours disclosed that Pennsylvania oils (representing blends of residuals and neutrals) show only very little precipitable sludge, while Mid-Continent oils give tremendous amounts of a hard carbonaceous sludge. In fact, more than half of the latter were found to have deposited a hard, carbonized mass after 400 hours, though the supernatant oil remained perfectly fluid, a behavior similar to that which was observed with a Pennsylvania

(Continued on page 54)

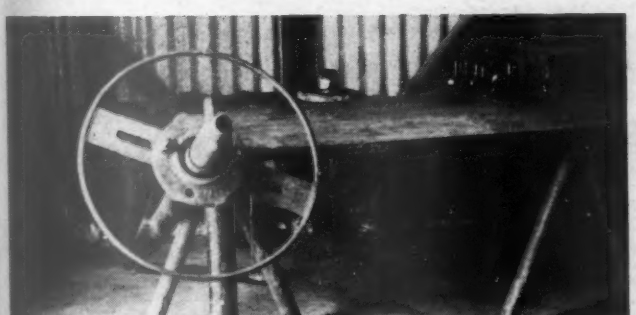
PLANT PRACTICES

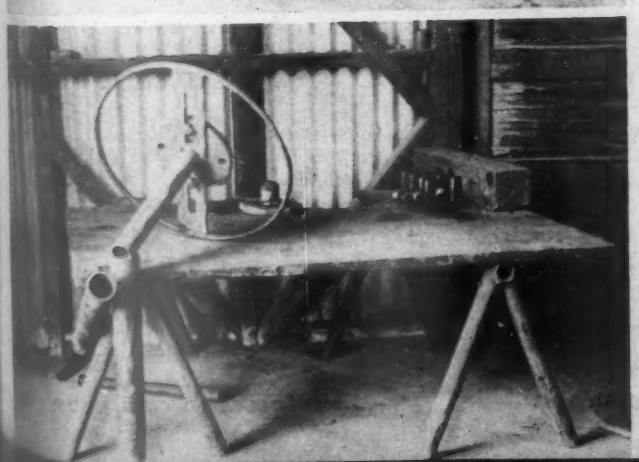
Exchanger Tube Cleaner Employs Air Motor

AN effective tool for cleaning the inside of tubes of exchangers and commodity cleaners has been improvised by operators in a California refinery. The principal part of the tool is an air motor, similar to those commonly used for "rattling" cracking-furnace tubes. A sturdy steel rod, long enough for the tubes being cleaned, has a drill bit welded to one end. The other end of the shaft is fitted with a connection which has the universal attachment placed on the tube-cleaning heads. The entire assembly is light enough that a workman can use it easily, and the power is so small that the danger of ruining a tube is practically eliminated.

Home Made Motor Stand Mounted on Casters

A CONVENIENT and servicable stand was designed and made by a repair man in a refinery to support an electric motor employed for operating a small grinding wheel or a polishing buffer. The shaft of the stand is a piece of ordinary 2-in. pipe set in a heavy fitting which in turn is welded to a circular piece of heavy steel plate. A band tacked to the rim of the base prevents small tools and fittings from falling off, as the base is used as a tray for parts frequently used when grinding. Midway between the base and the bracket at the top of the 2-in. pipe is a blade from an agricultural disk harrow which also is used as a tray for wrenches and small parts. The bracket is shaped to support the motor with cushioning between the bracket and the motor itself. An extension on one side of the bracket supports the motor shaft and flexible power shaft connections. The entire stand is mounted on heavy casters so that it may be easily moved to any location in the shop where work requiring the motor is to be accomplished.





Special Swedge-Building Jig Attached to Welding Table

THIS special swedge-building jig is attached to one end of the welding-table support where two sleeves are tacked on, one standing vertical, and the other leaning at an angle of approximately 45°. The movable part is a short piece of 1½-in. pipe having a slotted cross member welded at one end to which it fitted a circular band, or hand wheel, to make it more easily turned when the welder is building a special fitting. The top end—carrying the slotted cross member—has a 2-in. collar welded on permanently, having good threads into which the 2-in. end of a 2 in. by smaller swedge is placed at the beginning of the welding operation. When larger swedges are to be made up, a common cast-iron bolted flange half is connected with bolts to the slotted cross member so that the large end of a 4 in., for example, can be screwed into the jig. The movable part is usually set into the vertical sleeve when tacking the two parts of the swedge nipple to each other, and then changed to the 45° sleeve when completing the bead at the junction of the two pieces. While the welder uses the arc "stinger" with one hand to make the weld, the other is employed to turn the jig so that the point of making the bead is always at the most convenient position.

Methods for Engineering Peak Power Requirements of Single Pumping Rigs

*by E. A. Braker**

IN the preceding description of the manner in which power requirements of the conventional oil-well pump vary greatly throughout a pumping cycle it was recommended that consideration be given to the use of the peak-torque-reducing counterbalance in order to increase the efficiency of prime mover operation.

Proposed Double-Speed Torque-Reducing Counterbalance

Fig. 4 shows an elementary application of a proposed double-speed counterbalance for equalizing the load on the speed reducer and prime mover throughout the pumping cycle. The counterbalance motion is timed so that its downward weight is most effective in assisting the prime mover at the instant of peak torque on the pump crank. This occurs when the crank is approximately horizontal. Exact timing will depend on the location of the speed reducer with respect to tail bearing on the walking beam, length of the pitmans, polished rod stretch, etc.

Theoretical advantage of the double-speed counterbalance in decreasing the torque on the speed reducer and equalizing the power requirement on the prime mover is shown graphically in Fig. 5. This figure further shows that the effective weight of the counterbalance multiplied by 2 and by the radius to its center of gravity should be somewhere between 35 per cent to 45 per cent of the peak torque on the pump crank. It must, of course, be possible to add or remove weight readily, as well as to slide the weight on its lever arm, so that quick adjustment can be made to suit individual well-pumping conditions.

To make proper provisions for driving the proposed counterbalance will require changes in the speed reducer so that a suitable low-cost enclosed drive to the counterbalance can easily be applied. To eliminate objectionable vibration, there must be a minimum of backlash and slack in the drive.

*International Harvester Co.

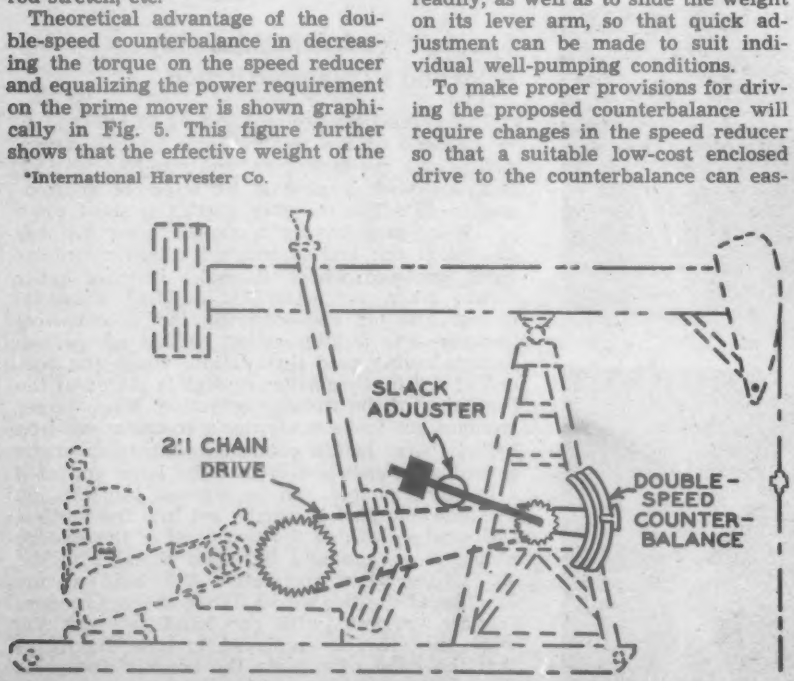


Fig. 4: Elementary installation of double-speed torque-reducing counterbalance

Speed-Reducer Torque With Double-Speed Counterbalance

Mathematical analysis of the new counterbalance is slightly more involved than for the conventional system. Again assuming simple harmonic motion, instantaneous torque at the speed reducer crankshaft for crank angles from 0° to 180° is given by the following equation, derived graphically from Fig. 6:

$$\text{Inst. torque} = FR \sin \theta + PFR \cos 2\theta \qquad (12)$$

FR, as before, is the peak torque, and P is the decimal per cent of the peak torque to be counterbalanced. For angles from 180° to 360°, FR sine θ in the formula must be preceded by a minus sign.

Load Variations With Double-Speed Counterbalance

With the 2:1 speed-up drive, an effective counterbalance of PRF at the pump crankshaft is obtained with an actual counterbalance of only PRF/2. When a crank with a weight F/2 at a radius of PR (Fig. 6) turns through an angle 2θ, equal to $2\theta_2 - 2\theta_1$, the work done is the weight F/2 times its vertical displacement. This vertical distance is obviously PR sine $2\theta_2$ — PR sine $2\theta_1$. Work done on or by the double-speed counterbalance is therefore (F/2) PR sine $\theta 2$ — (F/2) PR sine θ_1.

Simultaneously, the pump crank with radius R (Fig. 6) is rotating through an angle θ, equal to $\theta_2 - \theta_1$, opposed by vertical net polished-rod load F, which from 0° to 180° is negative and from 180° to 360° is positive. Corresponding vertical distance that F moves while the crank turns through an angle $\theta_2 - \theta_1$ is R cos θ_1 — R cos θ_2. Work done between the angles 0° to 180° is therefore FR cos θ_1 — FR cos θ_2; and between 180° and 360°, it is FR cos θ_2 — FR cos θ_1.

Resultant work required to move the pump crank through various angles in the cycle can now be calculated by combining the simultaneous

work of the pump crank and double-speed counterbalance as follows:

$$\text{Work, ft.-lb. } (0° \text{ to } 180°) = FR(\cos \theta_1 - \cos \theta_2 + P/2 \sin 2\theta_2 - P/2 \sin 2\theta_1) \quad (13)$$

$$\text{Work, ft.-lb. } (180° \text{ to } 360°) = FR(\cos \theta_3 - \cos \theta_1 + P/2 \sin 2\theta_3 - P/2 \sin 2\theta_1) \quad (14)$$

If the work were uniformly divided throughout each stroke, the amount done would be as given in Formula 5, or FR $(\theta_3 - \theta_1)/90$. Work variation from the average is therefore obtained as follows:

$$\text{Work variation } (0° \text{ to } 180°), \text{ ft.-lb.} = \text{Formula 13} - \text{Formula 5} \quad (15)$$

$$\text{Work variation } (180° \text{ to } 360°), \text{ ft.-lb.} = \text{Formula 14} - \text{Formula 5} \quad (16)$$

A negative result indicates that the work variation is "below average." Formulas 13 and 14 show that the variation in energy requirements depends on P, the decimal per cent of the peak torque counterbalanced. The problem is to select a percentage P that will reduce the work variation above and below the average during the pumping cycle to a minimum and yet keep the torque output load on the speed reducer as low as possible.

Pump-crank angles θ at which the instantaneous torque with the double-speed counterbalance is equal to the average torque can be found graphically as in Fig. 5, or calculated by the following equation:

$$FR \sin \theta + PFR \cos 2\theta = FR/1.57 \quad (17)$$

When P is taken as 42.2 per cent (0.422 FR is the theoretical flywheel burden in foot-pounds without the double-speed counterbalance), the pump-crank angles in the pumping cycle at which the output torque of the speed reducer is equal to the average torque requirement are: 16½°, 65°, 115°, 163½°, 196½°, 245°, 295° and 343½°. Pump-crank angles at which the torque is above or below the average then are:

Angles above average torque (deg.)	Angles below average torque (deg.)
16½ to 65	0 to 16½
115 to 163½	65 to 115
196½ to 245	163½ to 196½
295 to 343½	245 to 295
	343½ to 360

Table 1, calculated by using Formulas 1 and 12, gives a comparison of pump-crank torque required with and without the double-speed counterbalance. Table 2 has been calculated by Formulas 15, 16 and 17 and shows the theoretical flywheel load with a double-speed counterbalance equal in pounds-feet to the theoretical flywheel load, 0.422 FR, without the double-speed counterbalance. From Fig.

TABLE 1

Comparison of Pump-Crank Torque With and Without Double-Speed Counterbalance

Pump-crank angle (deg.)	Per cent of peak torque FR — Without 0.422 FR double-speed counterbalance	Per cent of peak torque FR — With 0.422 FR double-speed counterbalance
0	0.0	42.2
10	17.4	57.0
20	34.2	68.5
30	50.0	71.1
35	57.4	*71.8
40	64.3	71.6
50	76.6	69.3
60	86.6	65.5
70	94.0	61.7
80	98.5	58.7
90	*100.0	57.8
100	98.5	58.7
110	94.0	61.7
120	86.6	65.5
130	76.6	69.3
140	64.3	71.6
145	57.4	*71.8
150	50.0	71.1
160	34.2	66.5
170	17.4	57.0
180	00.0	42.2
190, 200, etc	Same as for 10°, 20°, etc.	

*Peak torque with 0.422 FR double-speed counterbalance is only 71.8 per cent of that without this attachment.

TABLE 2

Flywheel Load in Foot-Pounds With Double-Speed Counterbalance

Pump-crank movement in degrees	Work variation in foot-pounds with 0.422 FR double-speed counterbalance — Above aver.	Work variation in foot-pounds with 0.422 FR double-speed counterbalance — Below aver.	Per cent of 0.422 FR (flywheel load without double-speed counterbalance) — Above aver.	Per cent of 0.422 FR (flywheel load without double-speed counterbalance) — Below aver.
343½ to 16½		0.0545 FR		12.9
16½ to 65	0.044 FR		10.4	
65 to 115		0.0335 FR		7.95
115 to 163½	0.044 FR		10.4	
163½ to 196½		0.0545 FR		12.9
196½ to 245	0.044 FR		10.4	
245 to 295		0.0335 FR		7.95
295 to 343½	0.044 FR		10.4	

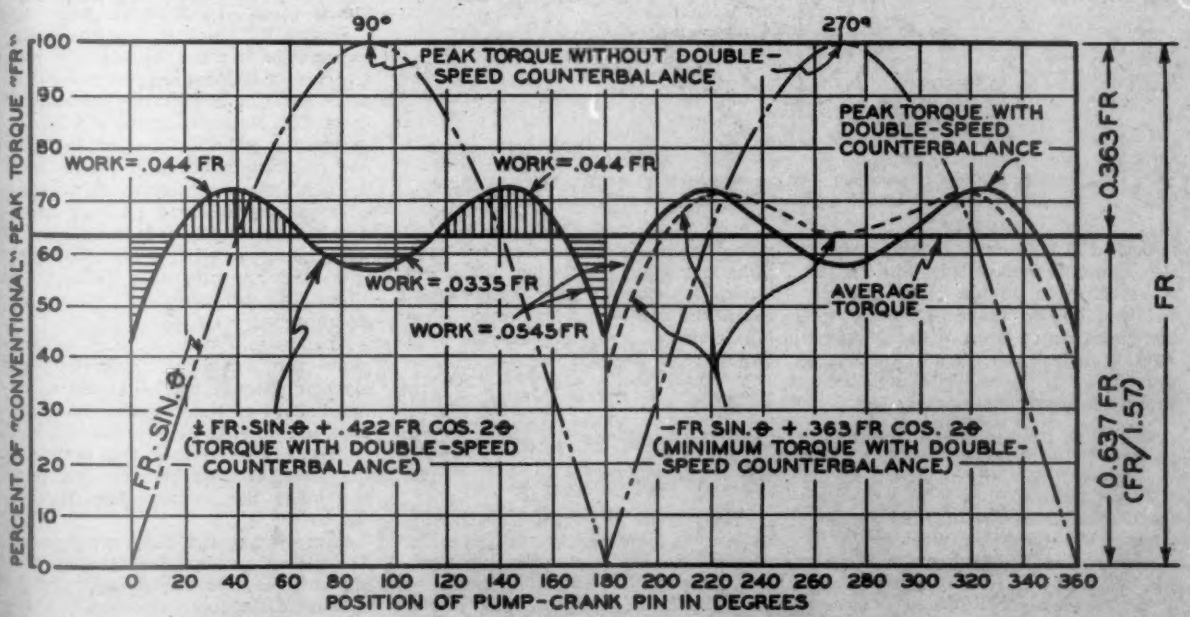

90°
270°
PEAK TORQUE WITHOUT DOUBLE-SPEED COUNTERBALANCE
PEAK TORQUE WITH DOUBLE-SPEED COUNTERBALANCE
WORK=.044 FR
WORK=.044 FR
WORK=.0335 FR
WORK=.0545 FR
AVERAGE TORQUE
FR·SIN.θ
±FR·SIN.θ + .422 FR COS. 2θ (TORQUE WITH DOUBLE-SPEED COUNTERBALANCE)
−FR SIN.θ + .363 FR COS. 2θ (MINIMUM TORQUE WITH DOUBLE-SPEED COUNTERBALANCE)
0.363 FR
0.637 FR (FR/1.57)
FR
PERCENT OF "CONVENTIONAL" PEAK TORQUE "FR"
POSITION OF PUMP-CRANK PIN IN DEGREES
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
0 10 20 30 40 50 60 70 80 90 100

Fig. 5: Diagram showing how double-speed counterbalance reduces peak torque and equalizes power requirements

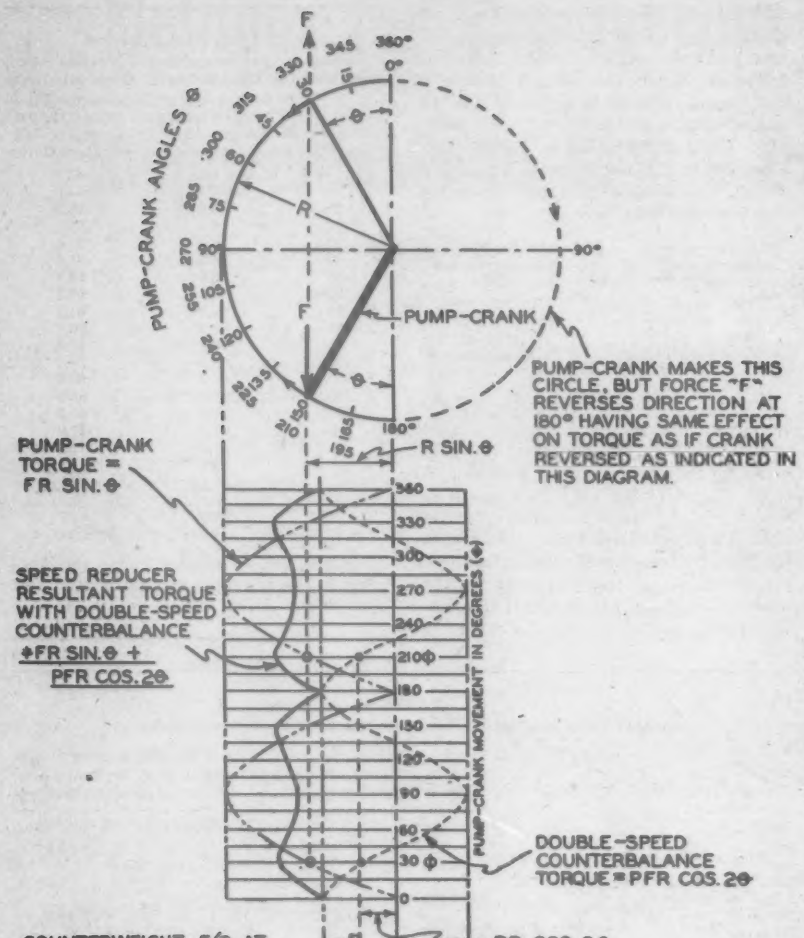

PUMP-CRANK ANGLES Θ
PUMP-CRANK
PUMP-CRANK MAKES THIS CIRCLE, BUT FORCE "F" REVERSES DIRECTION AT 180° HAVING SAME EFFECT ON TORQUE AS IF CRANK REVERSED AS INDICATED IN THIS DIAGRAM.
R SIN.Θ
PUMP-CRANK TORQUE = FR SIN.Θ
SPEED REDUCER RESULTANT TORQUE WITH DOUBLE-SPEED COUNTERBALANCE ±FR SIN.Θ + PFR COS.2Θ
PUMP-CRANK MOVEMENT IN DEGREES (Θ)
DOUBLE-SPEED COUNTERBALANCE TORQUE = PFR COS.2Θ
COUNTERWEIGHT F/2 AT RADIUS P×R MOVING AT EXACTLY DOUBLE PUMP-CRANK SPEED AND "TIMED" AS SHOWN.
PR COS.2Θ
PUMP-CRANK ANGLE Θ

Fig. 6: Diagram showing that pump crankshaft torque with 2:1 speed counterbalance is ± FR sine + PFR cos 2Θ

5, 0.422 FR appears to be very nearly the optimum theoretical value for the most effective double-speed counterbalance. It also makes possible simple direct comparison of the great reduction in load variation at the prime mover flywheel, the Wr^2 of which can therefore be proportionately less.

Wr^2 With Double-Speed Counterbalance

Table 2 shows that with a double-speed counterbalance of 0.422 FR foot-pounds, the maximum work variation (flywheel load) in the cycle is only 0.0545 FR. This is merely 12.9 per cent of the flywheel load without this new counterbalance. Only 12.9 per cent as much Wr^2 in the prime-mover flywheel is therefore needed to maintain the same coefficient of speed fluctuation (C). With the double-speed counterbalance, therefore, the following formulas replace Formulas 9, 10 and 11:

$$N_1 - N_2 = 160\ FR/Wr^2N \quad (18)$$

$$C = N_1 - N_2/N = 160\ FR/Wr^2\ N^2 \quad (19)$$

$$Wr^2 = 160\ FR/CN^2 \quad (20)$$

The regular flywheel clutch and pulley on heavy-duty multicylinder power units should usually have ample Wr^2 to give smooth operation throughout the pumping cycle of rigs equipped with the proposed counterbalance. The engine in the above-given example would need a flywheel with a Wr^2 of only 18.3 lb.-ft.^{2} instead of 142.

In addition to reducing the Wr^2 to a small fraction of that desirable with only conventional counterbalancing, the new attachment should make possible use of speed reducers with a peak torque rating at least 25 per cent less than that necessary with the present standard single-well rig.

Conclusion

While there seems to be outstanding advantages to the proposed counterbalance, its extra cost and difficulties of application in the field may tend to offset them. Its merits therefore can only be proved by actual comparative test under a variety of well-pumping conditions.

If the proposed counterbalance works in practice as well as in theory, it should greatly reduce wear and tear on both the prime mover and speed reducer, and should make single-well oil pumping smooth and efficient. Smaller engines operating under heavier continuous load could be used, which should be particularly advantageous in oil fields where insufficient engine heat has led to oil slugging and sour-gas difficulties. Certainly it is always considered good practice whenever possible to treat the basic cause rather than only the final effect.

Safeguard Fire Extinguishers Against Freezing

SEVERAL common types of fire extinguishers are subject to freezing and, if allowed to do so, may be rendered inoperative or even dangerous to use.

Soda-acid, foam and gas cartridge extinguishers must be kept in relatively warm locations (above 40° F. to be safe) or in suitably heated cabinets. The National Board of Fire Underwriters specifies that cabinets for use in subzero climates be of ⅞-in. double-wall construction and be heated by a continuously burning incandescent lamp of not less than 50 watts. Single-wall enclosures, similarly heated, are suggested for locations where temperatures —0° F. are not encountered.

Antifreeze chemicals, such as common salt, calcium chloride and glycerin, should not be added to extinguishers of these types, since foreign ingredients may reduce the effectiveness or change the nature of the discharge, or corrode the parts and make the extinguishers dangerous to use.

Pump tank and gas cartridge extinguishers can be protected by adding antifreeze chemicals supplied by the manufacturer. Chemicals other than these should not be used, however, as they may cause corrosion.

Fluid Viscosity Key to Reverse Circulation

by Harry F. Simons

Reverse circulation provides a method of completing or recompleting a well by the rotary method using oil as a circulating medium. The fluid velocity obtained by using the tubing as an eductor instead of the annulus is the basis for the method. This velocity is sufficient to wash ½-in. steel balls upward through the tubing. This is the first of three articles. The remaining two will describe the equipment used and applications of the method.

DURING the past 5 years' reverse circulation as a drilling, completion and recompletion method has grown from a novel and experimental project to a full-fledged and dependable tool of the producing department. It takes its place alongside the rotary and cable-tool methods of bringing in or reconditioning a well. Actually, reverse circulation might be placed between the two older methods as it makes use of some tools of both.

As the name implies the method is simply rotary drilling with the direction of the circulating stream reversed so that the fluid is pumped down the annular space and up through the drill stem instead of down the drill stem and up the annular space as in normal circulation. This direction of the circulating fluid should be impressed on those operating the equipment for at least in one instance a driller spent considerable time changing connections around so the circulation would be in the normal way; he thought he had discovered why the hole wasn't being made faster.

The question might be asked, "Why reverse the circulation?" There are a number of specific applications but the general purpose of reversing the circulation is to provide a greater velocity to the fluid stream returning to the surface so that it may more readily carry the cuttings and other material out of the hole. By increasing the velocity practically any fluid, more particularly crude oil, can be used as a circulating medium.

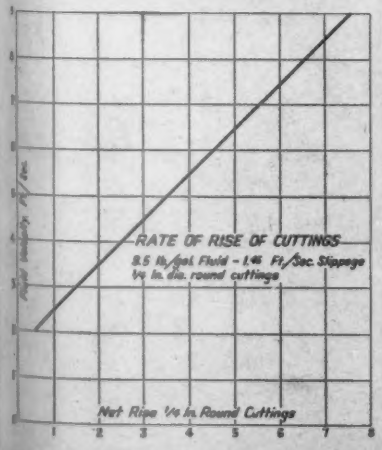


Fig. 1: Graph of net rise of cuttings is straight line and is the fluid speed less slippage

The advantages of completing or recompleting a well with crude oil, and in most instances oil from the particular formation being exploited, are obvious. There is no danger of water-blocking the formation as when either water or a poor quality water-base mud is used.[2] There is also no danger of mudding off a well or practically killing it because of an excessive hydrostatic head placed on the formation. Also, if sufficient upward velocity is available, the fluid stream can carry out the material either accumulated in the hole or brought into it by any means.

If oil can be used for a circulating medium, a better completion should result. Experience has shown to date that not only does an oil completion result in a higher initial but that the well will operate longer without a cleanout job and also its decline will be less than wells completed by normal means. Instead of calling the method "reverse circulation" it could be called "completing with oil" in most instances and the object of the method instead of the means used to describe the process.

The effect of fluid velocity on its carrying power is shown graphically in Fig. 1 for a 9.5/gal. mud.[3] This is for round cuttings of ¼-in. diameter but the relationship holds for any solid in a fluid and can be computed if the rate of settling of cuttings in a fluid is known.

According to Stokes' law a small sphere falls under the action of gravity through a viscous medium until it ultimately acquires a constant velocity.[4] This is given by the equation

$$V = \frac{2ga^2 (d_1 - d_2)}{9\mu}$$

Where

- V = Velocity (cm./sec.)
- a = radius of sphere (cm.)
- d_1 = density of sphere (gm./cc.)
- d_2 = density of medium (gm./cc.)
- μ = coofficient of viscosity (poises)
- g = acceleration due to gravity (cm./sec.^{2})

Crude oils have highly varying viscosities which have no relationship to the gravity of the oil but are rather dependent on composition and the amount of gas dissolved in the oil. A value of 33 to 40 seconds Saybolt for 40° A.P.I. gravity oil while not average is representative. Converted to kinematic viscosity this amounts to 2.55 centipoises which is equivalent to 2.367 centipoises absolute viscosity Such a viscosity would permit a falling particle of 2.65 gm./cc. and a diameter of 0.74 cm. to attain a velocity of approximately 1.77 ft./sec. through 40° A.P.I. gravity oil having a density of 0.8251 gm./cc.

This is a very small particle and from the standpoint of keeping the hole clean and removing the cuttings the particles of larger diameter are of more concern as they are both more common and more troublesome.

A variation of the falling particle formula which disregards viscosity gives the slip for round cuttings when

- V = slip (ft./sec.)
- a = diameter (in.)
- d_1 = density of cuttings (lb./ft.^{3})
- d_2 = density of medium (lb./ft.^{3})

as:

$$V = 9\sqrt{\frac{a(d_1 - d_2)}{d_2}}$$

For flat cuttings the equation becomes:

$$V = 3.5\sqrt{\frac{a(d_1 - d_2)}{d_2}}$$

The slip of both round and flat cuttings in water is shown graphically in Fig. 2. It is interesting to note that round cuttings have a slippage of 2.57 times that of flat cuttings as the above formulas indicate. Actually, most of the cuttings from a well are flat instead of being spherical in shape but it is well to have a fluid velocity sufficiently great to take care of the latter type as there are some present.

The slippage of cuttings must be deducted from the fluid velocity to obtain the net rise. In straight drilling the flow upward in the annular space

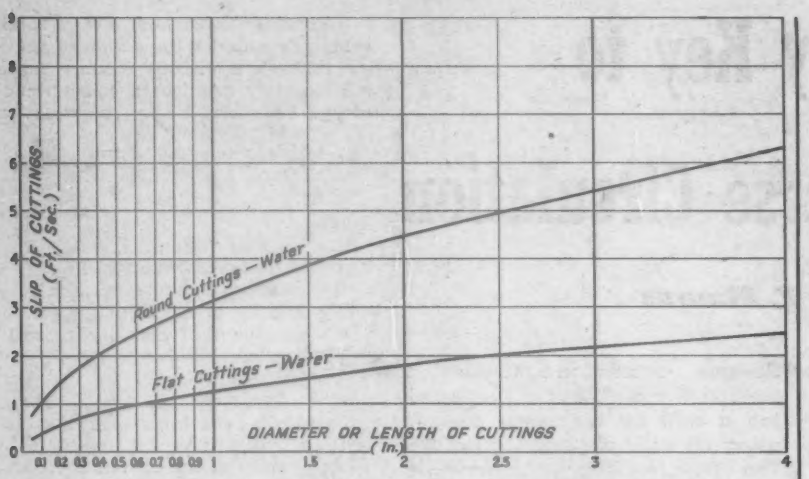


Fig. 2: Chart showing the relationship of round and flat cuttings on slippage; also the effect of the size of cuttings on slippage

is somewhere between 3.5 and 8 ft./sec. and the net rise of ¼-in. cuttings is somewhere between 2.8 and 7.3 ft./sec. for flat-type particles and 1.2 to 5.7 ft./sec. for round-type particles. At many places in the hole it is very much less than the above values due to an enlargement in diameter causing a serious reduction in the stream velocity.

On the other hand educting through the tubing, as in reverse circulation, very high fluid velocities are obtained, that for a 5-in. by 12-in. pump operating at 50 s.p.m. being 24.12 ft./sec. through 2-in. tubing. It is interesting to note the maximum-size spherical particle of the maximum expected density which a fluid stream of the velocity above could carry to the surface. This is shown graphically in Fig. 3 which is the graph of the equation solved for "a" when the velocity is 24 ft./sec., the density of the fluid is 51.50 lb./cu. ft. (sp. gr. 0.8251 for 40° A.P.I. oil) and the density of the particle is varied

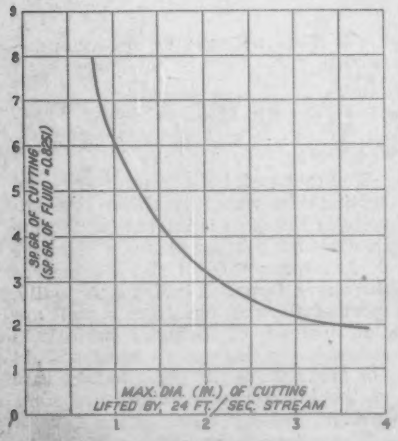


Fig. 3: Relationship of density and size of cutting on slippage in a 24-ft.-per-second stream of oil

from 155.07 lb./ft.³ (sp. gr. of 2) to 529.64 lb./ft.³ The velocity of a 0.76-in. diameter sphere with a specific gravity of 8 falling through oil would be 24 ft./sec. and any spheres of the same density but lesser diameter would be brought to the surface.

Theory Coincides With Practice

The theory coincides with the practice for even large pieces of steel are washed from the hole and up through the tubing during reverse-circulation operations. Most of the particles, or pieces, are flat or angular but steel balls 0.5 in. in diameter have been washed out of the hole. Steel or iron parts lost in the hole can be washed out so long as they are small enough to pass through the tubing. Floats, casing shoes and bit bearings cause no difficulty. After the particles reach a certain size, near that of the diameter of the tubing, their velocity approaches that of upward fluid stream due to the inability of the fluid to bypass the particle. A 1½-in. core, for instance, would come to the surface very quickly as there would be only approximately ¼ in. clearance between it and the 2-in. tubing.

It is the high fluid velocity of the return stream which is the foundation of reverse circulation plus the fact that the direction of the fluid stream may be changed at will so that the wall of the hole may be washed with normal circulation and then the debris brought into the well bore washed out by reverse circulation.

While this discussion concerns mostly the use of oil as a circulating fluid during reverse-circulation completions and recompletions, there is no limitation on the type of fluid used although oil is more often selected as the medium. There are cases where an oil-base mud, a low water-loss mud, or water may be selected to meet the conditions. Muds and water provide a greater head and in cases

(Continued on page 54)

A view of one of the several cycling plants designed and constructed by Petroleum Engineering, Inc. Manned by dozens of technicians skilled in their respective specialties, this organization is constantly at work . . . and has been for 15 years . . . taking over the processing problems of producing and refining property owners to design and erect natural gasoline plants, repressuring plants, vapor recovery plants, and "pure" hydrocarbon plants. Petroleum Engineering, Inc. Offices: Tulsa, Houston.

Photographed for Petroleum Engineering, Inc.
By Robert Yarnall Richie

Front Lines in REFINING

by Arch L. Foster

Ultra-High-Speed Engines

FOR long years speeds of electric motors up to 17,500 r.p.m. have been common, many motors for special purposes exceeding this speed. These speeds have been possible and practicable with present-day materials and designs because of the entirely rotational nature of the motion involved.

In steam engines and those powered by hydrocarbon-air mixtures—internal combustion engines—speeds have been limited because these power plants convert reciprocal motion into rotary motion. Reciprocal motion requires the complete stoppage and reversal of direction of heavy, rapidly moving parts twice for each revolution of the rotating part, and the crankshaft. Because of the huge moments of inertia developed under such conditions at high speeds this type of prime mover has never been able to match the power outputs, per unit of mass, of the purely rotational electric motor or of the steam or gas turbine.

Now comes Carl T. Doman, vice president of Air-Cooled Motors Corp., before the Metallurical Section, Society of Automotive Engineers, and deposes that in a few years following the war engine speeds will increase rapidly. To offset the inherent disadvantages of this higher speed the engines will become smaller and smaller, lower weight/power ratios.

Speeds of 6,000-7,000 r.p.m. will not be unusual, he says. It will be necessary to lighten the moving parts especially to reduce to bearable limits the inertia of these high-speed parts. Doman says that the air-cooled engine will have the front seat in this development, giving an indispensable advantage in net power, lower weights, greater construction simplicity, higher combustion efficiencies and inherent advantages which "the water-cooled engines can never possess."

This is an interesting observation by a well-informed engineer on what is to follow the war. Presumably if this development continues, new principles and designs must be used in ignition systems and other parts of the engine. Also it is reasonable to presume that some revision of fuel properties and specifications will be needed. How fast must a fuel charge burn to function efficiently in such high-speed engines?

New Desulfurization Process

DESULFURIZATION of high-sulfur petroleum fractions from as high as 3 per cent sulfur to 0.02 per cent is reported by Byrns, Bradley and Lee of Union Oil Co. of California (Ind. Eng. Chem., Nov. 1943, p. 1160, Vol. 35). The catalyst is cobalt molybdate, either supported on bentonite or pelleted without support and used in the presence of hydrogen. Yields of 99 per cent of the treated stock charged to the unit are claimed. Regeneration of the catalyst 11 times without serious loss of activity of the regenerated material is reported also.

The process, which has passed the semipilot-plant stage, consists essentially of passing a petroleum fraction such as straightrun or cracked gasoline through a large vaporizing section and in the vapor phase through the granulated or pelleted catalyst bed. This step is continued until the presence of appreciable amounts of hydrogen sulfide in the exit vapors indicates need for catalyst regeneration. Regeneration is carried out in situ in a nitrogen-air mixture gradually increases air concentration from zero to 100 per cent during a 6-7-hour period, and 950° F. temperature is maintained. A lower temperature effects only partial regeneration under the conditions employed.

A charge of 25 grams of catalyst reduced the sulfur in a sour stock to 0.02 per cent, 77 l. being processed before regeneration was necessary. Exhaustive tests show that this process is especially good for all types of sulfur, more particularly the thiophene (ring) type of sulfur which is removed quantitatively. Tests also proved that the catalyst is the molybdate, the chemical combination of cobalt oxide with molybdic oxide, as neither oxide alone, nor a mechanical mixture of the two shows any considerable activity. Tests show that the concentration of hydrogen in the reaction mixture controls the degree of desulfurization, and that contact time is of secondary importance in the reaction.

Peculiarly it has been found that, using the alumina-supported catalyst, large amounts of copper-dish gum are found in the product (160-360 mg.). Unsupported or pelleted catalyst showed relatively low gum, 20 mg. or lower. Low preformed gum content is found when using either catalyst and the copper-dish gum may be controlled by either inhibitors or by clay treatment at 400° F.

With prospects of increasing sour crude runs, application of this method may be another solution of the problem of a rugged and effective catalyst for desulfurization.

Refiners and Aromatics

SIGNIFICANT indeed is the presence in the roster of the A.S.T.M. industrial aromatic hydrocarbons committee of eight important refiners and oil organizations. This new committee, D-16 in that society's list, is organized to develop standard test methods, definitions, specifications dealing with aromatic hydrocarbons of interest industrially. Products dealt with include benzene (benzol), toluene (toluol), xylene (xylol), solvent naphthas and other members of this large family.

Temporary chairman is J. M. Weiss, consulting engineer; temporary secretary is R. P. Anderson. Permanent officers will be elected in June 1944 at the annual meeting in New York.

It is not at all significant that A.S.T.M. should organize a new committee, of which it now has about 60. With the increase in interest and importance in things aromatic, that action is perfectly natural. The interesting item is the inclusion of seven oil companies and the largest oil association to its membership. It was announced unofficially, recently, that more toluene is now forthcoming from petroleum as source than is produced from coal tar. Refiners are vitally interested in specifications and test methods for controlling the quality and grades of these materials, and they are therefore quick to seize the opportunity to work with members of the coal (tar) industry to have the advantage of the experience of that industry. In our opinion this is the third significant move of the petroleum refining industry in its advance into the chemical industry. The first was the gradual, halting development of a nonbenzenoid hydrocarbon chemistry; the second the development of aromatics-forming processes with petroleum as raw material.

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OPERATING IDEAS

Ramp for Getting Equipment on Derrick Floor

MUCH of the drilling today is done with derricks mounted on substructures, and getting the heavy units in place often presents a problem. The accompanying photograph was taken in a field where wells are drilled to 7,000 ft. Mechanical rigs powered by two or three internal-combustion engines are used and the usual procedure is to set the engines and compounding drive on the same level with the derrick floor. The least of the major items weighs 3 tons and the heaviest 24 tons, although the latter can be divided into two parts which weigh approximately 15 and 9 tons each. As the substructure is more than the height of a truck bed, provisions must be made for placing these heavy items on the derrick floor. This is done by using a ramp such as that shown, the inclined portion of which is approximately 30 ft. long. It is made from old drill pipe and angle irons with heavy wooden flooring. In working position it rests on blocks so that the top end is level with the derrick floor and the lower end approximately the height of a truck bed. A winch truck on the opposite side of the derrick can then pull the heavy units off the transport truck and up the ramp to the derrick floor.

Fire Extinguishers At Wells Remote From Field Camp

AS a means of controlling small fires that might endanger wooden walkways and flooring over well cellars, the operator in one South Louisiana field has provided fire extinguishers at all wells which are not close to the field camp or fire-fighting facilities. The extinguisher is mounted on a convenient stand near the well. Such fires might be caused by carelessly thrown cigarettes or matches by some trespasser.

Concrete Pedestal For Reservoir

TO provide the proper elevation for the reservoir holding the chemical being injected into a distillate well by the chemical pump it was necessary to have some type of structure on which to set the drum. Steel and wood being scarce, a concrete foundation was fashioned using a drum for a form. The top outer edge of the concrete was beveled so the bottom of the barrel, instead of the rim, supports it. The straps welded to the barrel aid in preventing its being knocked from the pedestal.

FIRST HF ALKYLATION PLANT COMPLETES FULL YEAR OF SUCCESSFUL OPERATION

This news is extremely important to refiners who are considering means of increasing their production of vitally needed alkylate. It means that the HF process is beyond the experimental stage, and it means that valuable "know-how" is available. Refiners planning to increase alkylate production will be interested in the following facts.

1. Phillips Petroleum Company pioneered the research work necessary to develop the HF Alkylation process.

2. Phillips Petroleum Company designed, built, and started the world's first HF Alkylation plant and has successfully operated it for 13 months. Phillips' second HF Alkylation plant is also the country's second plant, and has been running nicely for over six months.

3. This combination of research knowledge, design "know-how" and practical operating experience naturally reduces construction and operating difficulties to a minimum.

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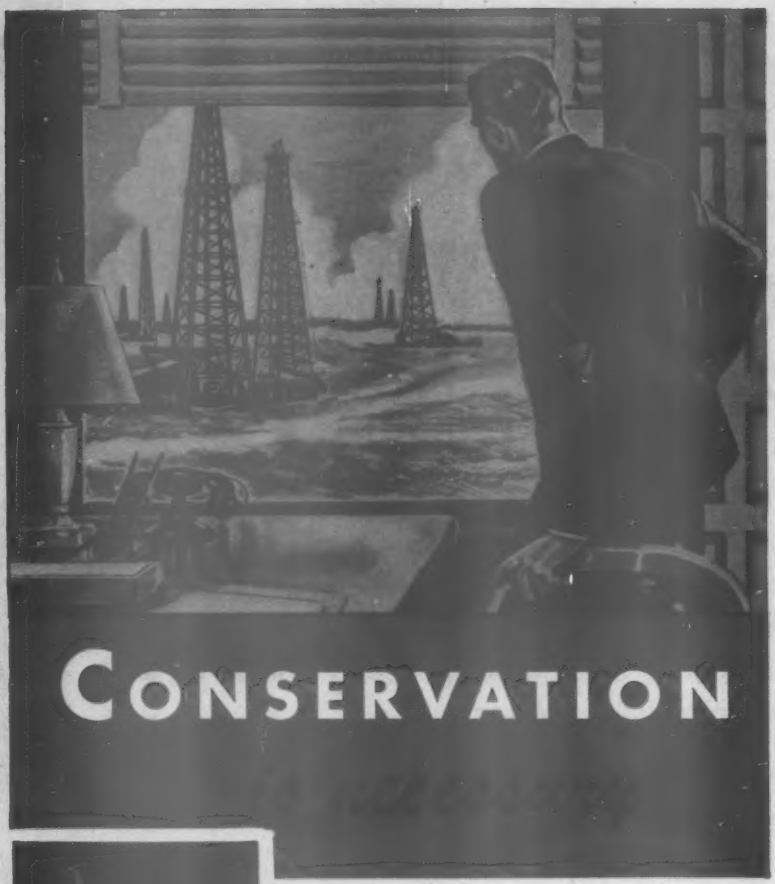

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Hydrogen Sulfide Reacts On Nervous System

A NUMBER of oil fields in the United States produce a crude oil called sour because of the hydrogen sulfide content. Gas produced in such fields and gas escaping from tanks in which sour crude is stored contain quantities of this same gas. This gas is extremely lethal in higher concentrations and a number of deaths have resulted through carelessness and failure to take proper precautions.

Explanation of the characteristics of the H_2S gas and how it affects human beings is contained in a recent Bureau of Mines publication (R.I. 3720) on the Magnolia oil field, Columbia County, Arkansas. This particular field produces 1,400 grains of hydrogen sulfide per 100 cu. ft., or 2.22 per cent by volume. The following paragraphs are taken from Bureau of Mines R.I. 3720.

"Hydrogen sulfide gas is colorless, heavier than air, extremely poisonous and corrosive to iron and steel equipment. In relatively low concentrations it has a 'sickly sweetish' taste and a disagreeable odor. Exposure to low concentrations of hydrogen sulfide gas (as low as 0.005 per cent) over a long period of time may irritate the eyes, breathing passages and lungs but seldom has serious consequences. In higher concentrations, however, hydrogen sulfide gas deadens the sense of smell, and the characteristic odor of low concentrations of gas as initially sensed is not a definite warning of danger. If the concentration is high, a person cannot always detect its odor before becoming unconscious, and if he is not quickly removed to uncontaminated atmosphere death may ensue.

"The Bureau of Mines conducted a series of tests and found from experiments on dogs, which have a susceptibility similar to man, that concentrations as low as 0.06 to 0.08 per cent of H_2S by volume may cause unconsciousness and death. As nearly as has been determined, hydrogen sulfide reacts on the nervous system, causing paralysis of the lungs, followed quickly by heart failure if the action of the respiratory center is not returned to normal within a relatively short period of time.

"The speed with which hydrogen-sulfide gas acts on a human being and the possibility of reviving the victim by removing him to uncontaminated atmosphere and applying artificial respiration make knowledge of precautionary and rescue methods valuable to anyone working in regions where hydrogen sulfide gas may be breathed. Consequently everyone working around this gas should be familiar not only with approved pro-

tective measures but also should be expert in applying artificial respiration.

"The following precautions should be observed under all conditions:

"1. Always stand on the windward side of any opening from which gas is escaping.

"2. Always wear a suitable gas mask, safety belt and life line when entering a tank, cellar, or any other enclosed place where gas may accumulate.

"3. Never attempt to determine the presence of harmful quantities of hydrogen sulfide gas by its odor.

"4. When a break in a line occurs that may permit hydrogen sulfide gas to escape, hold the breath and leave the danger zone.

"5. When a man is overcome, remove him to fresh air (using precautions for self-protection); apply artificial respiration at once and call a doctor."

BOOKS

WATER FLOODING OF OIL SANDS IN ILLINOIS. By Frederick Squires and Alfred H. Bell. Published by the Illinois Geological Survey. 101 pp. 25 cents. One copy free to Illinois residents and public libraries for 3 cents postage until March 1.

The Illinois Geological Survey in 1931 began investigations of secondary recovery both by air and gas repressuring and by water flooding. Some of the data gathered have been published in various reports, most of which are now out of print. In order to make available to the industry the information so far assembled in regard to recovery of oil by water flooding, this report has been prepared. This paper represents data on the suitability of Illinois sands for successful intentional water flooding in the older Illinois fields. A resume of present-day water-flooding technique is given.

HOW TO MAINTAIN ELECTRIC EQUIPMENT. Published by General Electric Co., Schenectady, N. Y. 370 pages, $1.75.

Here, in one volume, is information on the care of nearly every type of electric equipment. It contains more than 500 illustrations, dozens of new tables, many hitherto unpublished charts, and an easy-to-use index. Preventive-maintenance schedules and trouble-shooting charts are included on nearly all types of apparatus. Photographs and diagrams give suggestions on what to do to get maximum performance and longest life out of equipment, and also indicate what constitutes good maintenance procedure and some of the troubles that may arise from improper care.

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Information supplied by an Industrial Publication

The loss of recoverable alloys in steel scrap has been a major problem confronting the various conservation agencies. Proper segregation of scrap is one effective answer.

Segregation of scrap at the source is comparatively simple. The difficulty comes in preventing mix-ups in subsequent handlings. They can be prevented or remedied by applying two simple tests—spark and spot.

The presence of molybdenum, or nickel, or both, is readily detected by spark testing. Molybdenum causes an easily recognized secondary burst at the end of the spark stream resembling a spearpoint. Nickel produces a spot of intensely white light in the stream near the grinding wheel.

Both elements have a tendency, in the higher contents, to suppress the supplemental bursts characteristic of carbon steels.

Several spot tests for molybdenum have been developed. The simpler ones depend on the red color produced by either potassium ethyl xanthogenate or sodium thiocyanate added to a molybdate obtained from the etched surface of the steel. The dimethyl glyoxime test for nickel also depends on a red coloration. Many of these tests are approximately quantitative.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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MOLY

QUESTIONS on TECHNOLOGY

by W. L. Nelson

Lubricating Oil Classification Systems

What number systems are there besides the S.A.E. numbers? I refer to lubricating oils.—F. C. A.

Only two numbering systems for lubricating oils are widely used, i.e., the Society of Automotive Engineers (S.A.E.) viscosity number system and the Bureau of Ships number system. The advantage of the S.A.E. system is its extreme simplicity. It is based on viscosity but involves viscosity index in some degree because viscosities are given at two temperatures.

S.A.E. CLASSIFICATION SYSTEM
(Values in parenthesis are not official—but are commonly used)

S.A.E. No.	Viscosity, sec. Saybolt Univ. at 100° F.	Viscosity, sec. Saybolt Univ. at 130° F.	Viscosity, sec. Saybolt Univ. at 210° F.	Viscosity index Minimum	Viscosity index Maximum
10	.....	90-120	.....	.....	.....
20	(231-384)	120-185	(50-60)	(22.8)	(112.0)
30	(384-550)	185-225	(60-69)	(65.0)	(106.5)
40	(550-652)	255-(293)	(69)-80	(88.2)	(116.5)
50	(652-1244)	(193-397)	80-105	(45.8)	(103.0)
60	.....	.....	105-125	.....	.....
70	.....	.....	125-150	.....	.....
10W		(5,000°-10,000° F.)		.....	.....
20W		(10,000°-40,000° F.)		.....	.....

Undoubtedly the simplicity of the S.A.E. system accounts for its widespread use even for oils other than those used in the automotive industry.

The Bureau of Ships classification N.B.S. 431, entitled Lubricating Oil, is much more complicated. It consists of a series of numbers of four digits each, and a tabulation of complete specifications for all the oils that have been assigned numbers. The first digit in the number tells the kind of oil and the last three digits are used to show the numerical value of the viscosity. The meanings (kind or type of oil) of the first digits are as follows:

Class—		Vis. measured (°F.)
1XXX	Forced feed, high V.I. (95-100)	210
2XXX	Forced feed, low V.I.	130
3XXX	Forced feed, med. V.I. (65-75)	210
4XXX	Compounded marine engine	210
5XXX	Mineral cylinder	210
6XXX	Compounded steam cylinder (tallow)	210
7XXX	Compounded steam cylinder (lard or tallow)	210
8XXX	Compounded air cylinder	130
9XXX	Diesel engine (heavy duty)	130

As an example, the 1XXX series oils now in service are 1042, 1047, 1065, 1080, 1100, 1120, and 1150 covering the range of 42 to 150 viscosity at 210° F.

The significance of the Bureau of Ships classification can be illustrated by comparing Bureau of Ships oils with the corresponding S.A.E. oils, thus:

S.A.E.	Bureau of Ships
10W	1042
10	2110
20W	1047
20	3050 or 9170
30	3065 or 9250
40	3080 or 9370
50	3100
60	3120 or 1120
70	1150

The Bureau of Ships tabulations showing other specifications of the oils is too elaborate to present here but the detailed specifications of Oil No. 1065 may be given as an illustration.

Color	no minimum
Reaction	neutral
Neut. No., max.	0.1
Fatty oils, per cent	none
Precp. No., max.	none
Free sulfur or corrosive compounds	none
SO_3 as sulfonates	none
Water	none
Carbon residue, max.	0.6
Nature of carbon residue	loose and flaky
Ash, per cent, max.	none
Total sulfur, per cent, max.	0.5
Nature of oil	100% mineral
Spec. and A.P.I. gravity	no requirement
Flash point, °F., min.	420
Pour point, °F., max.	zero
Cloud point, °F., max.	20
Vis., Saybolt Univ. at 210° F.	62-68
Vis. index, min.	95
Emulsion test (time to settle in minutes when stirred at 180° F.), in distilled water	60
Work factor, min.	0.85

The Bureau of Ships classification is not well suited to regular industrial practice because it is based on the needs of the U. S. Navy. A similar classification but based on the needs of industry would be useful in facilitating the use of oils.

Carbonaceous Petroleum Byproducts Are Nearly Nil

The writer is interested in securing information relative to the distillation of petroleum into various byproducts and, particularly, into carbon byproducts. I would appreciate very much advice as to where works on such topics might be obtained.—R. T. P.

The carbonaceous byproducts of petroleum distillation amount to nothing more than the carbon, salt, dirt, etc., that accumulate on pipe-still tubes or in the hot reaction chambers of cracking processes. The total of such material probably does not exceed ½ lb. per barrel and is perhaps much less. As indicated above, this so-called carbon is a mixture of pipe scale or rust, sediment from the crude oil, salt or other mineral matter from the brine in the crude oil, corrosion products from the pipe lines or walls of refinery equipment, carbon or asphaltic material formed by thermal decomposition of the oil, and finally a sizable portion of liquid oil which saturates the above debris. Such material is nearly worthless and is an unlikely starting material for either a fuel or carbon-rich product, particularly when other sources such as coal are available.

Among the carbonaceous materials that have a definite value are such products as petroleum coke, furnace black, and asphalt. These products are deliberately made at the expense of other materials that might be produced and hence can only be called byproducts in the sense that they are produced jointly along with many other products or are generally less valuable than most other petroleum products.

These materials have attracted little attention because of their low market value, and hence no books and very few articles have been published about these materials.

Petroleum coke is discussed by E. B.

Swanson in the U. S. Bureau of Mines Economic Paper 9 (1930), and perhaps more completely in "Science of Petroleum," Vol. 4, page 2,774, Oxford Univ. Press, New York, 1938. Although petroleum coke has certain advantageous characteristics, such as high heating value, essentially no clinker-forming ingredients, little ash, and in many instances little sulfur, it may also contain some volatile material which tends to produce soot. For this reason it must be dried by some high-temperature process, such as the "calcining" process mentioned on page 522 in Petroleum Refinery Engineering, second edition page 522. McGraw-Hill Book Co., Inc., New York, 1941, or it must be produced by some process (such as the Knowles Coking-Oven process) which involves a high-temperature drying operation as the final step in the process.

Asphaltic materials are also discussed briefly in the reference book just mentioned (pages 154-156, 376-378) but to gain a more complete knowledge of asphaltic materials, the book entitled "Asphaltic and Allied Substances," by Abraham D. Van Nostrand Co., New York, 1929, should be consulted. Powdered asphalt and similar substances are discussed on page 74 of The Oil and Gas Journal of May 27, 1943, and Furnace Black, on page 62 of the March 11, 1943, issue.

Asphaltization Tests

(Continued from page 32)

overhead distillate. These oils formed excessive amounts of hard carbonaceous sludge already in the first stages of the test which increased steadily in amount as the asphaltization test progressed.

The best way to differentiate generally between the so-called nonasphaltizing oils is to determine their petroleum ether insoluble or still better, to determine their viscosity at 210° F. after completion of the 400-hour asphaltization test. This is illustrated in Table 7, which shows the differences in viscosity increases of two typical, nonasphaltizing oils; one, oil No. 6, a straight Pennsylvania neutral, the other oil

TABLE 7

Oil—	Saybolt viscosity at 210° F. Before testing	After 400 hrs. A.T.	Per cent viscosity increase
Oil No. 6	48 secs.	276 secs.	480
Oil No. 7	55 secs.	188 secs.	340

TABLE 8

	Saybolt viscosity at 210° F. Before testing	After testing	Per cent viscosity increase
Sample a	48 secs.	282 secs.	234
Sample b	48 secs.	274 secs.	226

No. 7, a Mid-Continent solvent-treated oil.

The reproducibility of the results obtained is demonstrated in testing another Pennsylvania 180N oil in duplicate, in Table 8.

Summary and Conclusion

Lubricating oils were found to lose their fluidity and turn into an asphalt-like material under certain conditions of oxidation. A study of the conditions under which this phenomenon occurs has led to the development of a simple, reproducible and inexpensive test which can be utilized for testing samples of potential diesel oils. The asphaltization tendency of lubricating oils is evaluated by measurement of increase in viscosity of the oil, i.e., loss of fluidity of the oil. The time required to convert a lubricating oil under the operating conditions of the asphaltization test into a jelly-like, barely moble mass is called the asphaltization time or asphaltization index and is expressed in hours.

Several factors which influence the asphaltization tendency of oils have been investigated. It was established that it is the residual oil hydrocarbons which cause the formation of the cementizing sludge leading to asphaltization of a lubricant.

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TABLE 6—EFFECT OF ACID TREATMENT

Samples—	A 34% 122 viscosity acid-treated cylinder oil plus 66% 180 neutral	B 30% 150/155 viscosity acid-treated cylinder oil plus 70% 180 neutral	C Conventional Pennsylvania basic HD of S.A.E. 20
Specific gravity	28.1	28.3	29.3
Viscosity Saybolt at 210° F., seconds	56	56	56.5
Flash, °F.	440	445	425
Fire, °F.	495	495	475
Color	5R	5R	5R
Asphaltization index	336	336	172

Above data suggest that acid treatment has a beneficial effect on the A.I. of lubricants as evidenced by the higher A.I. of samples A and B.

Reverse Circulation

(Continued from page 42)

of high-pressure wells they are advisable to relieve the well head of some of the pressure to which it may be subjected. A fluid with a greater density than that of oil may be needed when the available pump will not produce sufficient fluid velocity for oil to carry out the cuttings. In some wells water may be used when making a connection to prevent the tubing from being unloaded due to the pressure. This is done by simply using normal circulation and pumping the desired amount of water into the tubing. After the connection has been made the water can be reverse-circulated out. It need not come in contact with the formation.

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Packers Used for Leaky Tubing

Several types of packers have been designed and used successfully for correcting trouble occurring due to leaks in tubing on water-flood properties of Lynde, Walter & Darby near Chanute, Kans. One of the packers is of an eccentric type which is put on new pipe of either ¾-in. or 1-in. diameter, run inside the leaking tubing.

Setting of the eccentric packer can be done with two men and a pulling machine at a total cost of $60; other common ways of correcting such trouble cost $100 to $200. Altogether Lynde, Walter & Darby has installed 25 of these eccentric packers.

For plugging wells, these eccentric packers are used with a blind nipple above the packer.

In service, the eccentric packers have shown that they are capable of withstanding 800-lb. pressure.

The eccentric packer is set by an eccentric grip expanding the rubber of the packer; this eccentric grip is effected by screwing down after the packer is in place. During the operation of setting, springs hold the rubber. This type of packer requires no anchor and no holddown.

SPECIAL RATES INSTEAD OF DAY PAY FOR CORING OPERATIONS

THERE has long been a desire on the part of both operators and drilling contractors to place as many as possible of the routine drilling operations on a flat, per unit, monetary basis. Utilization of the day-work rate in the drilling contract has been the customary method of payment to the contractor for full activities required by the operator, which prevented the contractor from proceeding with normal drilling activities but this method is not wholly satisfactory. It brings up the problem of divided responsibility for the hole and drilling equipment, duplicate supervisory personnel, divided authority, and often the question of the condition of the hole at the time the operator takes over and starts coring. Some arrangement whereby all responsibility and authority remain with the contractor during coring would be most desirable for both the operator and the contractor provided the contractor were adequately compensated for the work done and the operator assured of a competent and conscientious effort on the part of the contractor to recover the greatest possible percentage of the section cored.

Three Methods of Payment

This desirable objective can more easily be achieved in development drilling where coring costs have been established by experience. Three methods of payment have been used:

1. A stated price per core.
2. A stated price per foot cored.
3. A stated price per foot recovered.

Each has its merits but none is a perfect solution to the problem unless experience has established all of the factors necessary for an equitable payment to the contractor while at the same time providing assurance to the operator that due diligence will be employed in accomplishing his objective; the recovery of the maximum amount of the section cored. The cost of coring can be broken down into its component parts and values assigned and an over-all price determined regardless of whether the operator uses his own tools or pays the contractor for his work. The elements of cost are:

1. Rig time.
2. Coring equipment.
3. Supervision.
4. Supplies.

An analysis of these costs indicates the disadvantages inherent in all of the three methods of payment outlined above and the reason why so much of the coring currently done is paid for on a day-work basis in spite of the many disadvantages of that practice.

Illustration

For the purpose of illustration, let it be assumed that a given rig has a base operating cost of $384 per 24-hour day, or $16 per hour; that two conventional cores are taken, one at 3,000 ft. and one at 9,000 ft, and compare the costs:

Depth of core—	3,000 ft. (hours)	9,000 ft. (hours)
Round-trip time	1.5	8
Two round trips	3	16
Circulation before coring	1	3
Time actually cutting core	2	2
Total elapsed time	6	21
Cost at $16	$96	$336
Head, catcher	84	84
Supervision and supplies	10	10
Total cost of core	$190	$430

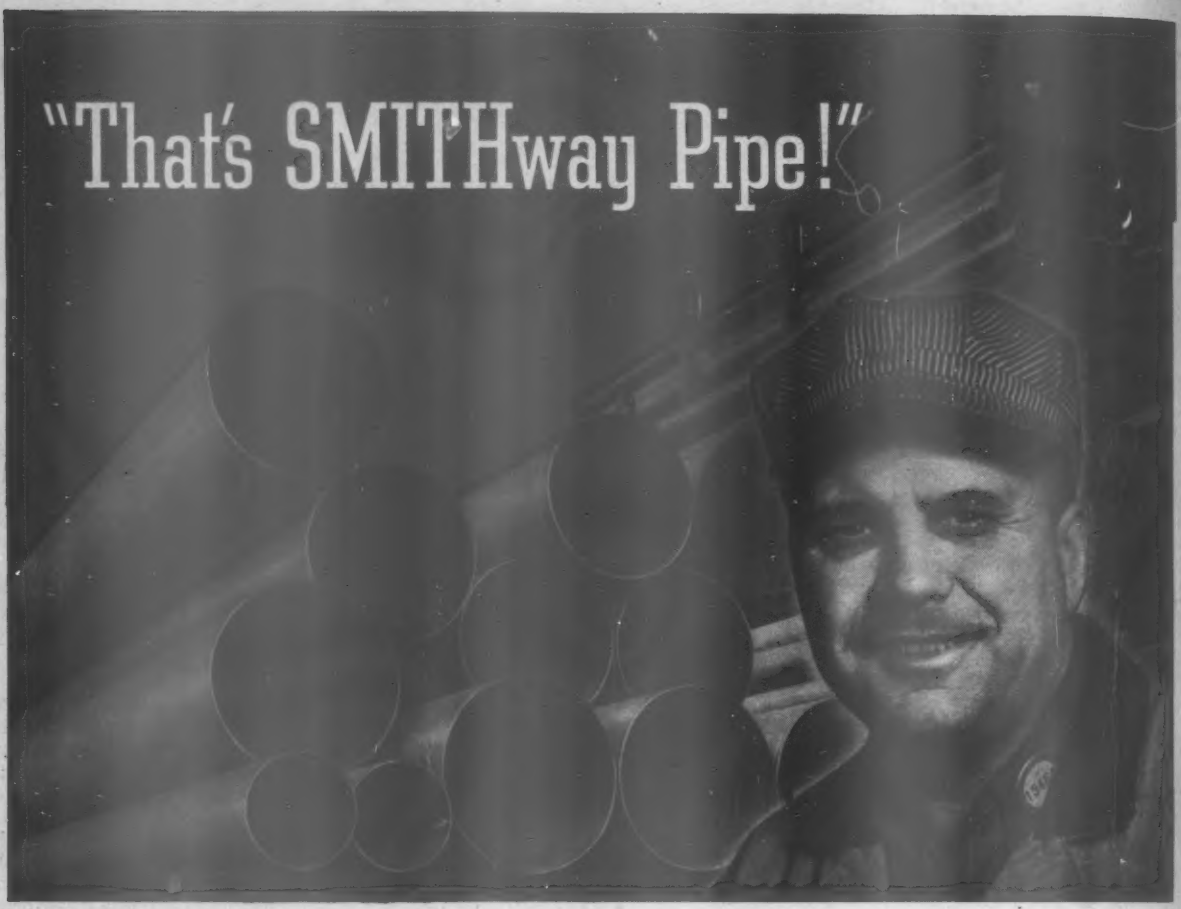
It is apparent that one core cost $190 and the other $430 and that the only difference in the two cores was the depth at which they were taken. Therefore, payment method No. 1, above, a stated price per foot cored, needs adjustment both for depth of core and length of core cut; if the above example were used for a 10-ft. core, cut in 2 hours, it follows that a 5-ft. core could be cut in 1 hour which would change the total cost of the two cores but $16 each, which is only a small part of the fixed cost of each core. The depth at which the core is to be taken and its approximate length are more surely known in development drilling, and based on an analysis of previous coring, an equitable charge for coring on either a unit or a per-foot cut basis can be established before drilling begins.

Desirable for Operators

Payment method No. 3, a stated price per foot recovered, is probably the most desirable from the operator's standpoint because under that arrangement he has the greatest assurance of diligence and care on the part of the contractor. However, this method requires the maximum of experience and knowledge of coring conditions in a given area if fair prices are to be established. Some formations defy satisfactory recovery regardless of the care exercised by the drilling crew; others yield well above 90 per cent recovery with practically no effort. These conditions should be known and accepted before coring in a given well is attempted under payment method No. 3. For example, let it be assumed that the above prices are fair and equitable for conventional coring under the conditions set out for a 10-ft. core in each instance, and establish the price per foot of recovered core that would meet these costs.

Depth of core (ft.)	3,000	9,000
Cost of 10-ft. core	$190.00	$430.00
Cost per foot of core recovered at:		
100 per cent recovery	$19.00	$43.00
80 per cent	22.75	53.75
60 per cent	31.67	71.67
50 per cent	38.00	86.00
40 per cent	47.50	107.50

It may be seen that payment for coring under method No. 3, stated price per foot of recovered core, should be adjusted so that factors of depth, length of core and estimated recovery are given adequate consideration. This is often possible in development drilling but seldom in exploratory work.



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That's what you want and that's what you get with SMITHway Welded Line Pipe.

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Engineering Fundamentals No. 121

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

MARSH FUNNEL VISCOSITY

THE Marsh funnel is a device very commonly used at rotary drilling wells for checking the mud viscosity. Actually, this device does not measure the true viscosity of the mud; but gives only a rough measure, in purely arbitrary units, of the flow resistance of one mud at a given rate of agitation as compared to that of another mud. Values obtained with the funnel have no particular mathematical significance and thus are of no value in making flow calculations or any other calculations involving viscosity in absolute units.* Experience with the device has shown just what range of flow resistance, as indicated by reading taken with the funnel, is desirable for certain well conditions. In this way, it furnishes a quick and simple means of determining at the well whether the mud viscosity is within limits which experience has shown to be proper. Its simple and rugged construction have made it easily adaptable to use at drilling wells.

The Marsh funnel has been adopted by the American Petroleum Institute as a standard device for measuring mud viscosity. The funnel is shown in Fig. 1. It is cone shaped, 6 in. in diameter at the top, and 12 in. high. The small discharge tube at the bottom is 2 in. long and is accurately bored to $\frac{3}{16}$-in. diameter inside. A screen is attached to the inside of the funnel $\frac{3}{4}$ in. below the rim and extends half way across the circular cross-section of the funnel. The open half at the top allows easy cleaning of the funnel. Funnels with standard dimensions are available in at least three different materials, viz.; chrome-plated copper, enameled iron, and rubber.

Three different methods have been used for determining the viscosity of mud with the Marsh funnel. Only one of these methods is now accepted as standard procedure by the American Petroleum Institute, but the other two methods are still used.

The procedure for A.P.I. standard test consists of placing the funnel in an upright position and filling with mud to the 1,500-cc. mark (screen level) by pouring the mud through the screen while preventing flow from the lower tip of the funnel by holding a finger against the tip opening at the bottom. The finger is released allowing mud to discharge into a 1-qt. receiver. A stop watch is started at the instant the finger is released and stopped at the instant the receiver is filled by the stream from the funnel. The time of efflux in seconds is reported as the viscosity. This is often spoken of as the full-funnel viscosity (1,500-cc. in—1 qt. out). In order to reduce to a minimum the effect of gelling, the reading should be taken immediately after the mud has been violently agitated, as in the well circulating system or by an electric stirring device in a laboratory.

The calibration of the funnel should be checked periodically with pure water at 70°F. (plus or minus 5°F.). The time of efflux for 1 quart (946 cc.) of pure water at this temperature should be 26 seconds (plus or minus 0.5 seconds).

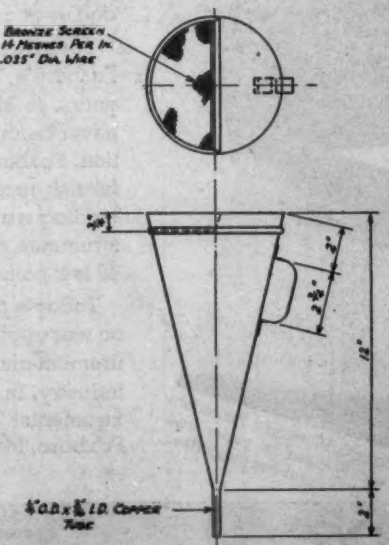

Fig. 1

Another full-funnel method, formerly included in the A.P.I. code but no longer recognized as standard procedure, consisted of placing 1,500 cc. in the funnel and measuring the time in seconds required to fill a 1,000-cc. receiver. In all other respects the method was the same as that described above for the present standard full-funnel method. For calibration purposes by this nonstandard procedure, the efflux time for pure water should be 28 seconds.

The "drip-point" method, although no longer standard procedure, is still used some in mud testing. Using this method, 500 cc. rather than 1,500 cc., of mud is placed into the funnel, and the elapsed time from the instant flow begins until the instant that continuous flow stops and the mud starts to drip is taken with a stop watch. This time in seconds is reported as the drip-point viscosity of the mud. In calibrating a funnel with pure water using this method, the efflux time should be 19 seconds.

A certain amount of care should be exercised to prevent the funnel, receiver, or measuring cups from becoming dented or distorted from their standard shape by rough treatment. This is sometimes a source of error in using this equipment. Care also should be taken that the funnel is clean, and has been flushed.

The Marsh funnel viscosity which it is desirable to maintain at a well is dependent upon several factors such as mud density and certain well conditions. As an example, a mud weighing 10 lb. per gal. should have a standard full-funnel viscosity between 35 and 55 seconds. It would not be desirable for the viscosity of such a mud to ever exceed 60 seconds.

*This does not mean that the apparent viscosity obtained by the Marsh funnel cannot be converted to absolute units. J. E. Owen demonstrated by quite a large number of tests that Marsh funnel readings can be converted to absolute units. Such data have no particular significance in flow calculations, however, because of the fact that the absolute value obtained is true only for the particular rate of agitation existing during efflux from the funnel. Owen reports the results of his experiments as "A Comparison of Marsh-funnel and Stormer Viscosities of Drilling Muds." A.I.M.E. Petroleum Technology, September 1941.

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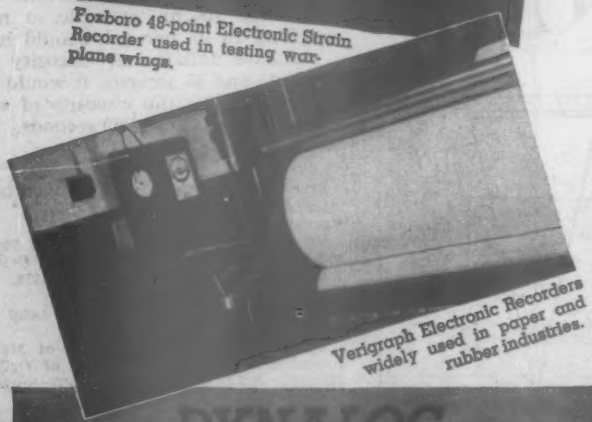
Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

Let's Get Down to Earth

ON ELECTRONIC PROCESS INSTRUMENTS!

Installation of DYNALOG Electronic Temperature Recorder in wood chemicals plant.

Foxboro 48-point Electronic Strain Recorder used in testing warplane wings.



Verigraph Electronic Recorders widely used in paper and rubber industries.

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There's little likelihood that electronic instruments will soon replace all of today's standard industrial instruments. The majority of processes require no radical improvements in instrumentation. Yet, Foxboro's pioneering research already has demonstrated how electronic sensitivity can importantly increase the usefulness of instruments for some applications ... and make possible *the first practical instrumentation ever available* for others!

For example, rubber and paper industries have used Foxboro's Verigraph Electronic Recorders for many years, to obtain weight-and-moisture measurements never before available. In wartime chemical production, Foxboro Electronic Temperature Recorders now furnish records that can be read to 1/10°C. And in leading warplane plants, other Foxboro Electronic Instruments enable exact readings of wing strains at 48 test-points, almost simultaneously!

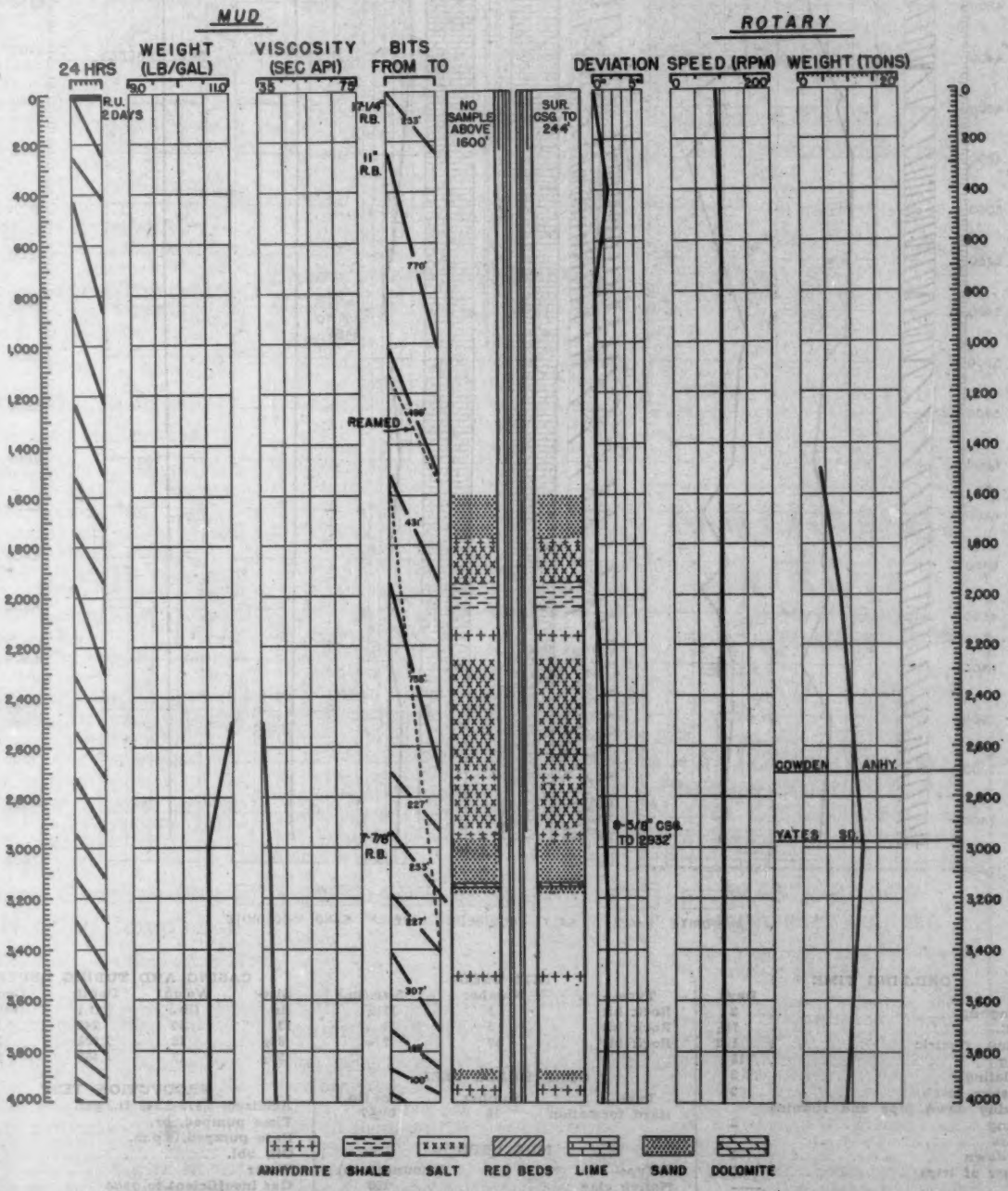
Today's production of these instruments is focused on war applications. Tomorrow, these and other measurement-and-control advances will be available to all industry, in Foxboro's new DYNALOG Electronic Instruments! **The Foxboro Company, 60 Neponset Ave., Foxboro, Mass., U. S. A.**

DYNALOG measurement and control by FOXBORO

Discovery Well, Clabberhill Pool, Andrews County, Texas

SKELLY OIL CO. 1 UNIVERSITY "K"
SW Sec. 28, Blk. 9, University lands,
elevation 3,189 ft.

CONTRACTOR
Davidson Drilling Co.



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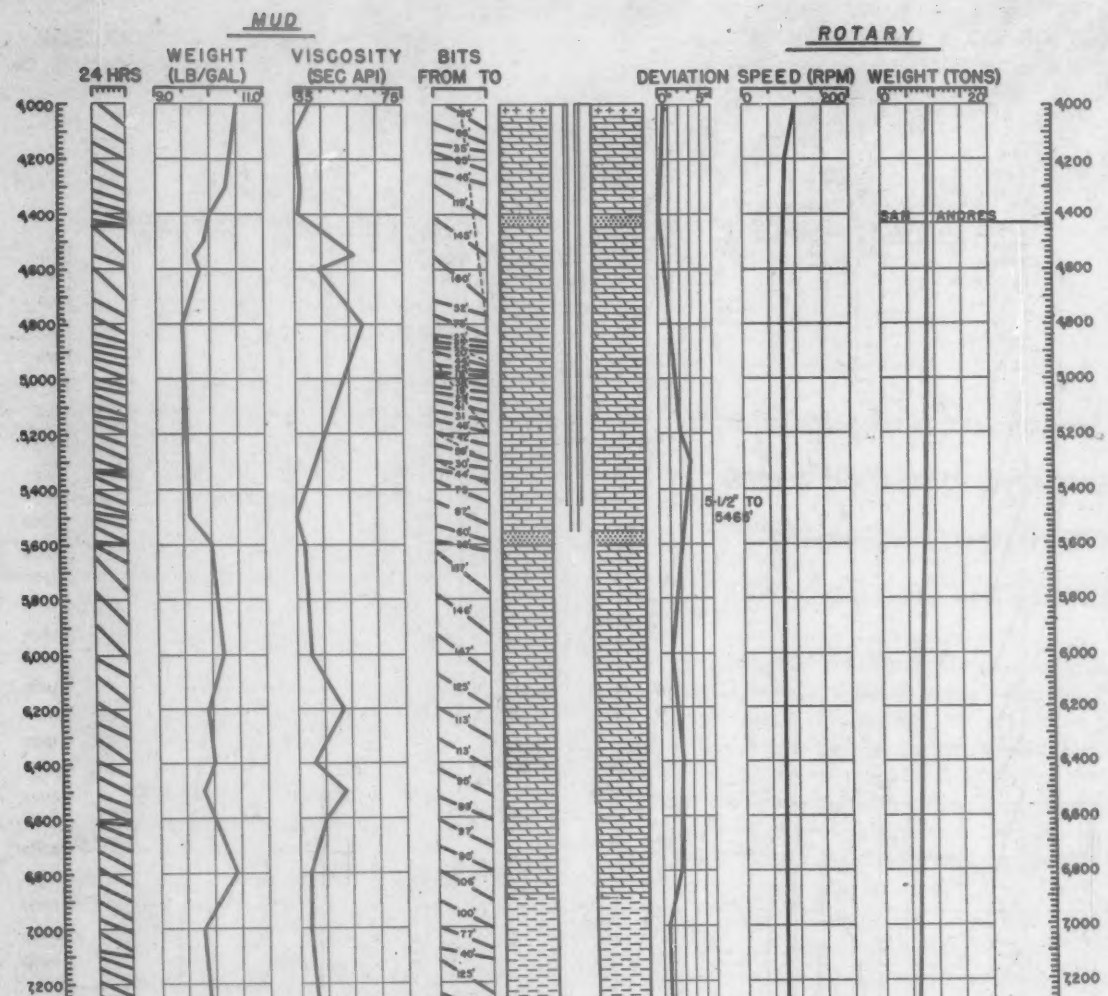
Journalog

Discovery Well, Clabberhill Pool, Andrews County, Texas (Continued)



DRILLING TIME

	Days
Rigging up	2
W.O.C.	7½
Logging, electric	1/3
Coring	18
Circulating	3
Drill-stem test	3
Breaking down pipe and running casing	2
Repairs	1
Shut down	2
Number of trips	92
Total rotary time	116

BITS USED

Type—	Number	Size (in.)
Rock bit	1	17¼
Rock bit	5	11
Rock bit	57	7⅞

CORE HEADS USED

Type—	Number	Size (in.)
Hard formation	16	6½-7

MUD USED

Type—	Amount (tons)
Native clay	100
Impermex	80

CASING AND TUBING DEPTH

Size (in.)	Weight (lb.)	Depth (ft.)	Cement (sacks)
13	50	244	175
8⅝	28	2,922	250
5½	17	5,485	225

PRODUCTION TEST

Acidized, 5,470-5,545 ft., gal.	1,500
Time pumped, hr.	24
Rate pumped, s.p.m.	12-54
Oil, bbl.	177
Water	none
Gas insufficient to gage	
Gravity	33

REFINING

Big Aviation Gasoline Output Reported by Refinery Head

NEW YORK.—Enough aviation gasoline to fuel 1,200 four-engine bombers on a round-trip raid over Germany from England is produced daily by Socony-Vacuum Oil Co., Inc., President John A. Brown reported last week, adding that war gasolines make up 41 per cent of the company's gasoline output.

The company's investment in equipment for the aviation-gasoline program, Brown said amounts to around $90,000,000 of which half has been added since Pearl Harbor. Socony-Vacuum, he said, is responsible for all except $2,800,000 for toluene which was financed directly by the Government.

South Penn Makes Another Cut in Sales to Refineries

PITTSBURGH, Pa. — South Penn Oil Co., largest supplier of Pennsylvania Grade crude oil, last week announced a curtailment of 5 per cent in sales to refineries, bringing the total reduction since May 1943 to 25 per cent. The cut was effective January 1, and the company said refiners had been notified.

Declining production in Pennsylvania crude in recent months, along with the fact that demand runs far ahead of output, has resulted in a steady decrease in stocks of oil.

In the year ending October 31, 1943, stocks of Pennsylvania crude oil declined 833,633 bbl. Average production was 69,860 bbl., almost 10,000 bbl. below the October 1942 output.

High-Octane Gasoline Plants On Gulf Nearing Completion

HOUSTON, Tex. — Completion of 12 new 100-octane gasoline plants on the Texas Gulf Coast within the next 90 days is counted on, Max D. Miller, of Washington, D. C., director of construction for Petroleum Administration for War, says. Absenteeism of common labor was blamed by Miller for delays in getting the plants finished.

"They will work a day or so and quit. That puts the whole construction program behind."

Sixteen major plants and several minor ones are located in this area, which includes Baytown, Houston, Beaumont, Texas City, Port Arthur and Corpus Christi.

"We have tried to bring to the laborers the importance of their work in completing these plants so 100-octane gas may be supplied in quantities sufficient to keep up with the increased tempo of the air war," said Miller. "Their work is vital and when they fail to report they are doing as much as a soldier who is AWOL."

Miller came here for conferences with Houston PAW officials.

Slow Delivery of Materials Delays Completion of Plant

CORPUS CHRISTI, Tex.—Slow delivery of critical materials, not absenteeism among workmen, has delayed completion of Great Southern Corp.'s 100-octane gasoline plant, according to Edwin Singer, president. Singer's statement follows a recent one by a representative of the Petroleum Administration for War declaring absenteeism was holding up the construction program.

"What little absenteeism we have is due in the main to illness and severe weather," Singer said. "Labor has done its part in our project, and common labor particularly is to be commended for working at rates which were frozen at less than those paid by other war projects in our area."

Singer said the delay in completion of Great Southern's plant was due primarily to difficulties in delivery of critical equipment. This, he explained, was because in the war construction program which began immediately after Pearl Harbor, 100-octane projects were not given the priority which war experience later proved they required.

Mexico Announces Refinery Construction Program

WASHINGTON, D. C.—A construction program, including refining facilities to utilize gas from the Poza Rica oil field, will be undertaken by the Mexican Government through Petroleos Mexicanos, its agency in charge of oil production and distribution, the Department of Commerce announced last week.

Petroleos Mexicanos has installed a new laboratory for biological research at Tampico, which, among other things, will provide facilities for much of the testing of insecticides that formerly was done in the United States for Mexican account, the department said.

Mexican petroleum production in the southern area continued low in November, and the Minatitlan refinery operated below capacity, although one new well was reported brought in during the month. In the Tampico area, production showed a slightly higher daily average for the period ended November 18, compared with the preceding month, and stocks were slightly lower than at the October inventory.

Standard of Ohio Plant to Be In Operation Next Spring

CLEVELAND, Ohio.—The 100-octane gasoline plant under construction by Standard Oil Co. of Ohio at its No. 1 refinery here is scheduled for completion this spring. Work on the project, which represents an investment of about $8,500,000, began in September 1942. The plant will be capable of producing enough gasoline daily to carry 100 heavy bombers on a round trip between the British Isles and Berlin every 24 hours, approximately one-sixth as much aviation fuel as was being produced in the

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United States before Pearl Harbor. It will employ the Houdry catalytic process.

There are 135 miles of tubing in the plant's nine Houdry cracking and treating cases. Oil lines required the equivalent of 37 miles of 4-in. pipe. Steel plate, weighing 2,535 tons, is being used in construction of the plant, almost equivalent to the tonnage used in a Liberty ship. The 55 tons of welding wire used is equal to approximately 50 miles of welding. Water used for cooling the unit will total 26,800,000 gal. per day, enough to supply a city of 335,000.

The largest single piece of equipment shipped to the site was a 77-ft. treating tower weighing 82 tons. This tower is 10 ft. 6 in. in diameter and was transported from Wisconsin on three special cars. The plant will ultimately employ approximately 100 men, most of them drawn from present personnel at the company's Cleveland refinery.

Sketches of Plant Operators

H FRANK GOSS, superintendent of Humble Oil & Refining Co.'s Ingleside, Tex., refinery observed his twentieth anniversary with Humble recently, when Hines H. Baker, vice president, presented him with a diamond-studded gold service pin. Goss started to work on the old Burton high-pressure stills at Baytown, Tex., refinery in 1923. A year later he was transferred to the newly organized development department at Baytown. He carried on special research work and in 1929 returned to the refinery to take charge of the SO_2 plant during its construction. He remained in charge of operations, organizing and training an operating staff. In 1936 he was transferred to Ingleside refinery as assistant superintendent, and he became superintendent 3 months later.

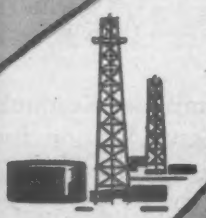
Goss is a native of Kellogg, Tex. In 1917 he joined the Army and served with the Eleventh Combat Engineers in the Thirty-sixth Division. Sent overseas, he fought through the St. Mihiel and Meuse-Argonne battles. He remained in France after the Armistice and attended the AEF University. Returning to the United States in 1919, he entered Rice Institute at Houston, Tex., and received his bachelor of arts degree after completing courses in chemistry and chemical engineering.

At Rice Goss paced the track team to letter 4 years. During the last 3 years of his college track career, he sprinted with Preacher Lindsey as his running mate. Goss led the Southwest conference in 100-yard dashes at 9.3.5;

and 220's in 22. In addition to titles in the Southwest conference, he won the cup in the Southern conference meet in New Orleans, La.

Goss' hobbies are hunting, fishing and raising turkeys.

ATTACK COLD WEATHER Paraffin Problems WITH



AT the first signs of paraffin accumulations in tubing, lead and flow lines, get a five gallon can or fifty gallon drum of easy-to-use Parid P-51 solvent —and find how quickly, efficiently and safely it does the job of clearing the lines.

Parid has field approval and is widely used —either full strength or dispersed in water. The cost is surprisingly low but the results will keep you sold from now on!

Always available at your supply store.

FOR PUMPING WELLS Parid P-51, full strength or dispersed in water, may be poured into the tubing between polish rod and tubing walls, by raising the stuffing box —without shutting down the well.

FOR FLOWING WELLS the fluid level is dropped by shutting in the well; connecting a pressure lubricator with the tubing and introducing Parid P-51 solvent into the tubing under pressure.

FOR FLOW LINES clear lines of oil and lubricate Parid P-51 into Lead line at well head. Then blow the solvent along the lines with gas from the casing. After two hours or more, flush with oil.

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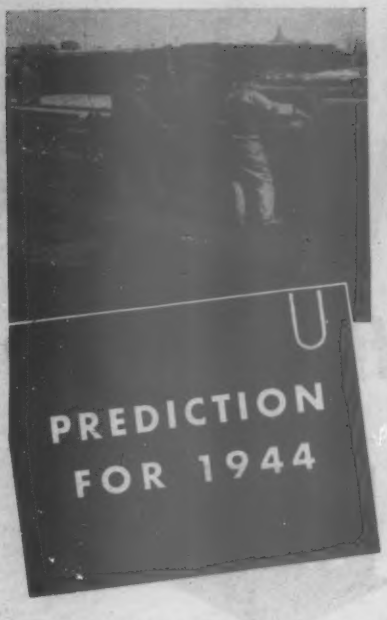

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PIPE LINES

Magnolia Ahead of Schedule For West Texas Outlet

With the completion of 225 miles early this week, Magnolia Pipe Line Co. is ahead of schedule in construction of 337 miles of 12-in. from Midland to Corsicana, Tex., which is to be completed before March. The project was advanced before recent weeks of bad weather to such an extent that progress has continued to exceed what was originally planned. Pipe laying has been contracted by Oklahoma Contracting Co. and Jones & Brooks.

Since the new line parallels an 8-in. line of the company, pumping equipment is installed at existing pipe-line stations. All of the work of installing pumping equipment for the new 12-in. line has been completed.

Great Lakes to Recondition Tulsa-Barnsdall Section

Great Lakes Pipe Line Co. will recondition 31 miles of refined products line in the section between the Tulsa and Osage counties boundary and Barnsdall, Okla. In this section a number of stretches have been designated for reconditioning. There will be skips where no reconditioning will be done. For a short distance from Tulsa County the system consists of 6 and 8-in. pipe; the remainder of the section to be reworked is 6-in. pipe.

Contract for the job has been let to A. C. Holder Construction Co. Work will be done under the supervision of A. C. Holder from headquarters in Tulsa. One gang will be on the project for about 3 months. Work starts this week.

The plan is to carry on spot-welding and half soling while products are being transported. At times when the line will be lifted from the ditch, pumps will be shut down.

Early this week, the Great Lakes organization was tying in loops which have recently been completed between Tulsa and Barnsdall by Asplund Construction Co. This looping totaled 10 miles of 6-in. in an 8-mile section and a 2-mile section. These loops fill gaps between previous loops. Consequently the new looping results in the Great Lakes company having a continuous 6-in. line from Tulsa to Barnsdall in addition to the parallel line consisting of a southern section of 8-in., a middle one of 6-in. and a northern one of 8-in. With the completion of the new work, the company will have two parallel lines for the whole system between Tulsa and Des Moines, Iowa.

Empire Considers Removal Of Seminole-Okmulgee Line

Empire Pipeline Co. is reported to have been giving consideration to a program for removing pipe economically from an Oklahoma crude-oil line. The line extends from Seminole to Okmulgee, Okla., and consists of 30 miles of 6-in. in the Seminole-Kingwood section and 25 miles of 4-in. in the Kingwood-Okmulgee section.

Sohio Completes Kentucky Line to Mount Vernon, Ind.

Sohio Pipe Line Co. has extended a crude-oil line from Union County, Kentucky, to the Smith Mills pool, Henderson County, Kentucky, by the construction of a 4-in. line from Smith Mills to the company's terminal on the Ohio River.

Ashland Pipe Lines Report Safety Records to NSC

The pipe-line department of Ashland Oil & Refining Co. recently reported to the National Safety Council

BUCKEYE MODEL 12 digs more trench in less time, at lower cost. Digs trench 15" to 24" wide — up to 5½' deep.

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the safety records of each organization under its supervision.

The Indiana-Illinois Pipe Line operations had been carried on safely for 896 days. The last lost-time accident occurred on January 15, 1941; in the meantime 227,025 man hours had been worked without an accident.

The Owensboro-Ashland Co., which is owned jointly by Ashland Oil & Refining Co. and Standard Oil Co. of Ohio has not had a lost-time accident in pipe-line work since September 30, 1941, during a 638-day period.

Eastern Kentucky Pipe Line Co. operated by Ashland Oil & Refining Co. has not had a lost-time accident since December 8, 1942.

Humble Takes Back West Texas Connections

The Humble Oil & Refining Co. is taking back its connections in the Wasson pool of Gaines and Yoakum counties, Texas, which were previously turned over to the Shell Pipe Line Corp. in April and May of 1942 when the Humble company was forced to curtail in West Texas because of closing down its line to Ingleside, Tex. Except for several thousand barrels of oil daily going to San Antonio, the line was closed because of transportation bottleneck created through the cessation of water movement of oil from Texas to the Atlantic seaboard.

Humble reopened its line to Ingleside late in 1943 and has been taking back its connections.

Allowable from the leases affected in the transfer was 17,341 bbl. daily in December 1943.

Shell Provides Outlet For Wheeler Pool

The Shell Pipe Line Corp. will build a 4-mile 6-in. pipe line from the 10,000-ft. Wheeler Ellenburger pool of eastern Wheeler County, Texas, to tie into the Wink-Midland 10-in. carrier of the Magnolia Pipe Line Co. Shell also will replace a temporary 2 and 3-in. line which serves the Monahan's 10,000-ft. pool of northeastern Ward County, Texas, with 3 miles of 6-in. line to a station near Monahan to tie into its New Mexico-McCamey system.

Cities Service Completing Cimarron River Crossing

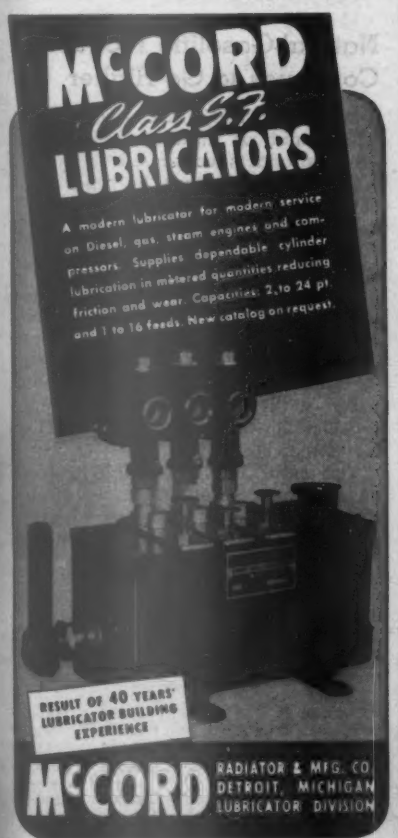
Cities Service Transportation & Chemical Co.'s 11,000-ft. crossing at the Cimarron River near Woodward, Okla., is being completed for the Guymon-Blackwell 240-mile 26-in. natural-gas line contracted by Bechtel-Dempsey-Price. For this crossing two lines have been laid at depths of 10 to 20 ft. across the river bed and the channel. A river crossing crew is being transferred from Buffalo to Alva, Okla., where a 5,000-ft. crossing of the Salt Fork River will be constructed. Later the gang will be moved to a point near Cherokee, Okla., for a 2-mile crossing.

Coal and Railway Groups Oppose Tennessee Line

WASHINGTON, D. C.—Coal and railway groups have filed a petition in the U. S. Court of Appeals opposing the Federal Power Commission's approval of construction of a natural gas pipe line of Tennessee Gas & Transmission Co. from Corpus Christi, Tex., to West Virginia.

Tom McGrath, attorney for the groups, sent a telegram so advising Chairman Houghton Brownlee of the Texas State senate committee which has had the pipe-line project under investigation.

"Believe we made conclusive showing of ability of coal industry to supply all industrial needs in Appalachian area," added the telegram from McGrath, who represents the National Coal Association, Anthracite Institute, United Mine Workers and Railway Labor Executives Association.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Natural Gas

Commission to Appeal From Gas-Field Proration Order

AUSTIN, Tex.—The state Railroad Commission has given notice of intention to appeal from an injunction issued in District Court here halting enforcement of proration orders for the Carthage gas field in Panola County. Alfred C. Glassell and Alfred C. Glassell, Jr., requested the injunction on a contention that their wells were given too small a share of the field's allowable.

Gas Partnership Problems To Be Decided by FPC

WASHINGTON, D. C.—Federal Power Commission has postponed from January 19 to January 25 a hearing which it will conduct in Monroe, La., to determine whether four men working as partners constitute a natural gas company within the meaning of the natural gas act; whether they provide a lawful utility service, and whether rates charged are reasonable. The men are W. C. Feazel, Monroe; J. Floyd Hodge, Ruston; Thomas J. Hill, New Orleans, and R. J. Leche of Covington, all of Louisiana.

Northern Natural Acquires Properties of Subsidiary

WASHINGTON, D. C. — Federal Power Commission last week issued an order authorizing Northern Natural Gas Co., Omaha, Neb., to acquire and operate all the natural-gas transmission lines, gathering lines, town-border stations, and certain appurtenant properties located in southwestern Kansas and owned by its subsidiary, Argus Natural Gas Co., Inc.

Northern Natural proposes to continue to perform the service heretofore provided through the facilities to be acquired, including delivery and sale of natural gas at wholesale to the Argus distribution systems and industrial and main-line customers. Argus will retain ownership and operation of the distribution systems and facilities used to serve its industrial and main-line customers.

The FPC states that the consideration involved is the net book value, estimated at $765,792.50 as of December 31, 1943, to be paid by applicant returning to Argus its 4½ per cent notes in the amount of $700,000, receipted as paid in full, and the remainder in cash.

The facilities to be acquired and operated by Northern Natural are used in part by Argus for transportation of natural gas from wells in the Hugoton field in Kansas and the sale of such gas in interstate commerce to Northern for ultimate public consumption in Nebraska, Iowa, Minnesota, and South Dakota, and for supplying natural gas to Argus distribution systems and certain industrial and main-line customers in Kansas.

WPB Extends Ban on Gas Sales in Eastern Area

WASHINGTON, D. C.—Extension of the ban on deliveries of natural gas in the Appalachian area to include commercial and industrial consumers who have standby facilities capable of utilizing fuel other than liquefied petroleum gas is announced by War Production Board. Hitherto the limitations applied only to consumers with standby facilities for burning bunker oil. WPB said its action, effective January 12, was designed to conserve natural-gas supplies until the new pipe line from Texas to West Virginia is completed.

Headaches in Gas Reports Eased a Little by FPC

WASHINGTON, D. C.—Headaches in the task of making annual reports are eased a little by a letter which Federal Power Commission has sent to executives of the nation's major natural-gas companies advising them that 23 schedules need not be prepared for 1943. The commission also modified its reporting requirements with respect to four other schedules in the report and agreed to accept, from natural-gas companies utilizing the mimeograph method of preparation, a total of 46 schedules from the annual report form for electric utilities for which die-impressed mimeograph stencils have been prepared to make more economical the preparation of multiple copies.

The action was taken in recognition of the shortage of trained personnel during the war. The reduction, which will minimize the time and labor required, follows conferences with the committee on statistics and accounts of National Association of Railroad and Utilities Commissioners, of Utilities Subcommittee of the Advisory Committee on Government Questionnaires, Bureau of the Budget, and representatives of American Gas Association and Edison Electric Institute. The letter states that the omissions and modifications apply only to reports for 1943.

Natural Gasoline

Wyoming Gasoline Plant Extensions Are Completed

Continental Oil Co.'s improvements and extensions at its Lance Creek, Wyo., gasoline plant to assist in the 100-octane aviation-gasoline program are undergoing final tie-in operations and are expected to be on the stream about February 1.

Capacity has been increased from 25,000 to 100,000 gal., primarily to furnish additional stocks for Frontier Refining Co. and Utah Oil Refining Co.'s aviation gasoline plants at Cheyenne, Wyo., and Salt Lake City, Utah, respectively.

Natural-Gasoline Production Continues to Go Higher

WASHINGTON, D. C.—Daily average output of natural gasoline and allied products continued to rise in November, according to reports received by U. S. Bureau of Mines, being 10,762,000 gal., compared with 10,614,000 gal. in October and with 9,960,000 gal. in November 1942. The major increases were in Texas, Louisiana, and the Appalachian territory.

Total stocks at terminals, plants, and refineries increased during the month, totaling 195,090,000 gal., compared with 187,530,000 gal. reported for October and 209,832,000 gal. on November 30, 1942.

The ratio of liquefied petroleum gases produced at plants continued to increase at the expense of natural gasoline. Demand for the liquefied product for fuel increased.

PRODUCTION
(Thousands of gallons)

	November	October
Natural gasoline	173,334	180,432
Cycle products	89,934	60,396
Liquefied petroleum gases:		
Isobutane*	17,346	16,338
Other L.P.G.*	72,240	71,862
Liquefied refinery gas	13,816	11,004
Benzol	8,400	8,400
Total production	532,602	546,798

*At natural-gasoline and cycle plants.

Exploration and Drilling

Week's Highlights

MOST of the prospective discoveries reported a week ago continued preliminary testing operations or coring for full determination of the commercial aspects of oil zones. This condition serves to emphasize the time lag between discovery of oil and development of a commercial well and the even greater delay between completion of a wildcat producer and a field.

Nevertheless, last week's prospective pool openers were followed by another normal crop of wells in the same classification, showing conclusively that the number of discoveries is largely a function of the volume of wildcat drilling. The ratio of discoveries to wildcats drilled is fairly constant in a range of 1 to 6 or 7. The number of discoveries, of course, is not necessarily an indication of the new oil uncovered. On the contrary, it is shown conclusively by preliminary analysis of the annual review material which will be published in full detail next week that discoveries in 1943 compare favorably with prewar years from a numerical standpoint but fall far short of a normal year in potential productivity.

Superficial examination indicates that the industry completed approximately 75 per cent of the original exploratory program outlined a year ago by federal petroleum agencies. The original goal of 4,500 wells, of course, was later modified to 3,400 and the industry came within a fraction of 1 per cent of hitting that mark.

Indicative of the emphasis currently focused on exploratory operations is the sustained high level of geophysical work. Approximately 350 crews are active although there has been a shift of personnel within the past 60 days from the northern states to those with moderate winter weather conditions. This shifting of geophysical crews to coincide with weather conditions is in itself a new departure in oil industry operations. Normally, field parties are brought in during the winter months when field work becomes impossible and assigned to interpretation or other inside duties until spring. All indications are, according to the liberalization of material and spacing restrictions, that the 1944 program of 24,000 wells, including 5,000 wildcats, is backed by much stronger support from all government agencies than was the case in the past year.

Solid line charts current weekly completions

COMPLETIONS IN ALL FIELDS . . .

(Week ended January 15, 1944)

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.	46	10	2	58	104,635	116	107
Ohio	1	10	5	16	51,126	34	19
Indiana	3	0	1	4	5,445	7	6
Kentucky	4	11	7	22	45,958	33	4
Illinois	14	0	17	31	90,226	64	73
Michigan	4	0	5	9	25,982	17	20
Kansas	12	0	15	27	90,288	49	55
Nebraska	0	0	0	0	0	2	2
Missouri-Iowa	0	0	0	0	0	2	0
Oklahoma	11	1	7	19	62,225	40	46
Texas:							
North Central Texas	8	1	9	19	44,722	35	46
West Texas	23	0	7	30	121,421	61	29
Texas Panhandle	4	0	0	4	12,650	5	10
Eastern Texas	3	0	8	11	72,787	21	5
Texas Gulf Coast	2	1	4	7	47,421	14	19
Southwest Texas	8	4	10	22	121,426	40	44
Total Texas	49	6	38	93	420,427	176	153
North Louisiana	2	0	2	4	16,120	8	10
Louisiana Gulf Coast	4	1	6	11	119,127	14	21
Total Louisiana	6	1	8	15	135,247	22	31
Arkansas	2	0	1	3	12,100	6	8
Mississippi aand Southwest	0	0	0	0	0	7	0
Montana	1	0	3	4	9,353	7	8
Wyoming	3	0	1	4	15,599	4	6
Colorado, Utah	0	0	0	0	0	1	1
New Mexico	4	1	6	11	34,875	15	9
California	29	2	5	36	134,519	76	28
Total United	169	42	121	352	1,238,015	878	574
Total previous week	160	41	116	326			
Week ending Jan. 16, 1943	183	30	107	320			

EASTERN TEXAS

Northern Smith County Well Now Testing Pettit Lime

DALLAS, Tex. — The most closely watched test in East Texas at this time is Skelly Oil Co. 1 Chisum, near Sand Flat in northern Smith County. Bottomed at 10,011 ft., this wildcat, which assured production from Paluxy sand when oil rose 6,000 ft. in the hole, is now testing the Pettit lime topped at 9,759 ft., showing porosity from 9,762-76 ft., and 9,846-53 ft. In an attempt to test this lower zone, casing was perforated with 41 shots from 9,844-56 ft., but the formation would not take the acid under 4,500 lb. pressure, and another attempt will be made before squeezing off the perforations and perforating opposite the upper zone. No attempt was made to test the porosity logged in the Travis Peak at 9,954-60 ft. Porosity was logged in the Rodessa section from 9,228-40 ft. and 9,255-80 ft., and this zone will be tested should the Petitt fail to produce. West of this well, Sun Oil Co. Mrs. Alice Patterson, Felix Flores Survey, was nearing the Paluxy in drilling below 6,735 ft. Paluxy in the Skelly well was found at about 7,950 ft. Phillips Petroleum Co. 1 Mrs. W. J. McMinn, Mary Long Survey, 2½ miles northeast of Greshame, ran electric log to 8,056 ft. This wildcat reported show of oil in Glenrose, topped at 7,760 ft.

Van Zandt County.—Delta Drilling Co. 1 Gipson-Echols unit, Walker Survey, north of Grand Saline, reported top of Travis Peak at 8,846 ft., and was drilling ahead below 8,930 ft.

Wood County.—Failure for the west side of the Quitman pool was registered at Shell Oil 1 M. H. Cox, Barefield Survey, which was dry at total depth of 6,654 ft. Five drilling wells are active in the pool, with a noticeable decline in new work in the last few weeks. The field seems to be pretty well defined on the southeast and north sides, with the only expansion possible on east and northwest.

EAST TEXAS WILDCAT COMPLETIONS

Henderson County: L. O. McMillan 1 Ella Warren, 1,360 ft. N of S line, 330 ft. W of E line tract and E. Edwards Sur., dry at TD 4,720 ft.

Navarro County: C. Andrade III and Sohio Oil 1 Mrs. B. C. Cunningham, 1,908 ft. SE along common lines Gage and Procella Sur., 50 ft. SW at right angles, elev. 365 ft., dry at TD 4,002 ft.

Rusk County: N. H. Wheless Drlg. Co. 1 J. M. Walker, 300 ft. from E, 600 ft. from S, A. G. Walling Sur., elev. 394 ft., massive anhydrite 6,011 ft., first Rodessa porosity 6,355-6,453 ft., second Rodessa porosity 6,492-6,513 ft., Pettit 6,968 ft., Travis Peak 7,099-7,120 ft., dry at TD 7,305 ft.

Wood County: Moncrief & Hyde 1 R. L. Simmons, 467 ft. from N, 1,200 ft. from W, 7-ac. tract, 2,400 ft. from southerly N, 3,750 ft. from easterly E, H. Nelson Sur., elev. 442 ft., Pecan Gap 2,772-2,950 ft., Woodbine 5,092-5,102 ft., no Paluxy sand, dry at TD 6,802 ft.

Plains Prod. 1 Mit Cox, 200 ft. from S and W, 6.17-ac. tract, 2,150 ft. from S, 160 ft. from E, J. Simpkins Sur., ¾ mi. S-SE Alba, elev. 431 ft., Pecan Gap 2,520 ft., Austin 3,598 ft., Eagleford 3,906 ft., Woodbine 4,350 ft., base massive anhydrite 8,025 ft., Pettit 8,550 ft., Travis Peak 8,882 ft., dry at TD 9,000 ft.

Roeser & Pendleton 1 Mrs. Dabney White, 660 ft. from N, 1,980 ft. from E, T. J. Griffin Sur., elev. 392 ft., Woodbine 5,870-5,900 ft., Georgetown 6,090 ft., no Paluxy sand, dry at TD 7,165 ft.

Smith County semiwildcat: Phillips Pet. 1 Mayfield Co., 600 ft. from N, 660 ft. from W, 121-ac. tract, Henry Cook Sur., SE Chapel Hill field, elev. 561 ft., Pecan Gap 2,967 ft., Woodbine 4,055 ft., Glenrose 5,987 ft., massive anhydrite 7,347 ft., Gloyd 7,747 ft., Hill 7,625 ft., James 8,070 ft., Pettit 8,258 ft., Travis Peak 2,498 ft., dry at TD 8,600 ft.

TEXAS GULF COAST

Deep Wildcat Plugged Back to Complete

HOUSTON, Tex.—Humble Oil & Refining Co. completed 1 Denman Kountze et al, Lot 1 Emily Smyth Survey A-792, about a mile northeast of Rockland in northern Tyler County, as a small oil well and the well was shut in last report pending final potential test. With total depth 8,010 ft., hole was plugged back to 3,477 ft. and perforated from 3,415-33 ft. it flowed, on last gage, 23.82 bbl. in 24 hours, part time on ¼-in. and part time on ⅛-in. choke.

Cecil V. Hagen is completing 1 R. A. and O. H. Wolters, Samuel Kenedy Survey A-44, Block 8, west extension test at Thompson field, Fort Bend County, in the sand at 5,391-5,408 ft. through perforations in the 5½-in. casing set on bottom at 5,426 ft. On preliminary test, with 2-in. tubing set at 5,362 ft. it flowed 437 bbl. oil in 24 hours on ¼-in. choke.

Seaport Oil Co. 1 Bennett, discovery well about a mile northwest of West Ranch field in Jackson County, is credited with flowing 55 to 60 bbl. daily on 3/32-in. choke, 25.1-gravity oil, from upper Marg sand from perforations at 5,062-66 ft. The lower sand, perforated at 5,580-85 ft. in Frio zone, showed gas condensate, no gage. Total depth is 5,785 ft., 5½-in. at 5,657 ft.

A new field seems definitely proven by Seaboard Oil Co. of Delaware in Wharton County in the 1 W. W. Duson, Section 49, ETRR Survey A-118, and operator is calling the new field "South El Campo." Location is staked for 2 W. W. Duson, 1,375 ft. west of the discovery well. The discovery, TD about 6,160 ft., 5½-in. on bottom, perforated at 6,150-54 ft., showed salt water and oil; squeezed and reperforated at same level, it flowed 185 bbl. daily through ⅛-in. choke, 5 per cent b. s. & w.; still testing for final completion.

TEXAS UPPER GULF COAST WILDCAT COMPLETIONS

Harris County: Sun Oil Co. 1 Maurice Hirsch et al, in James H. Isbell Sur., 4 mi. NW of Huffman, temp. abandoned, TD 8,821 ft. This wildcat flowed 1 to 1½ bbl. hourly on ⅛-in. choke, TP 150 lb., from perf. at 8,480-90 ft., 75 per cent salt water; flowed 30 bbl. in 24 hours on ⅛-in. choke from perf. at 8,490-8,500 ft., 50 per cent salt water, balance paraffin-base oil.

Trinity County: American Liberty Oil Co. 1 Southern Pine Lbr. Co., in S. H. McClain Sur. A-725, 10 mi. NW of Apple Springs, dry at 5,016 ft., sticky shale.

DAILY AVERAGE PRODUCTION FOR WEEK

	Jan. 15 crude oil	Distillate, allied products	Jan. PAW quota all oils	Jan. 8 crude oil
Arkansas	79,725	4,800	81,700	79,420
California	796,500	45,500	873,800	790,500
Colorado	7,200	.....	7,000	7,350
Eastern fields	66,750	9,450	83,350	72,950
Illinois	210,920	12,700	227,700	208,600
Indiana	13,120	.....	14,400	11,820
Kansas	273,600	6,200	291,200	265,900
Kentucky	21,250	3,000	29,000	22,625
Louisiana	358,205	32,000	375,700	358,820
North Louisiana	77,305	.....	.....	77,920
Louisiana Gulf	280,900	.....	.....	280,900
Michigan	57,100	200	56,200	46,100
Mississippi	46,700	.....	48,000	45,680
Montana	21,325	300	23,800	24,805
Nebraska	1,500	.....	1,300	1,500
New Mexico	112,600	6,000	116,600	112,600
Oklahoma	318,800	28,000	356,000	332,050
Texas	1,899,650	126,000	2,018,000	1,900,100
East Texas	366,200	.....	.....	366,200
West Texas	364,600	.....	.....	365,050
North Central Texas	140,200	.....	.....	140,200
East Central Texas	116,400	.....	.....	116,400
Texas Panhandle	97,900	.....	.....	97,900
Texas Gulf Coast	714,850	.....	.....	714,850
Southwest Texas	99,500	.....	.....	99,500
Wyoming	89,710	3,400	103,400	85,400
Total United States	4,374,655	277,550	4,707,150	4,366,220

Total production, January 1-January 15, 1944 ..... 65,544,265 bbl.
Same period last year ..... 57,849,520 bbl.

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ILLINOIS

McClosky Wells Are Large Producers

CENTRALIA, Ill.—Thirty-one completions in the past week in Illinois included 17 dry holes and 14 oil wells, with a total initial production of 2,313 bbl. Two 500-bbl. wells were reported, Central Pipe Line Co. 2 J. T. Henry, SW NE SE 13-2s-4e, Markham City north pool, in Jefferson County, producing 500 bbl. from McClosky lime at 3,052-56, 3,063-67 and 3,072-78 ft., which had been acidized, and Pure Oil Co. 1 Shotts, W½ SE NW 30-3n-9e, in the Schnell pool, Richland County, which produced 528 bbl. from McClosky lime at 2,978-92 ft. The only productive wildcat was an 11-bbl. well at a total depth of 420 ft. in Coles County.

ILLINOIS WILDCAT COMPLETIONS

Clark County: F. Mitchell et al 1 H. Weir, SW NE SE 12-9n-13w, dry at 1,500 ft. Ste. Genevieve lime top at 1,433 ft.

Coles County: Cooperative Oil 1 fee, SW SE SE 7-11n-11e, pumped 11 bbl. from Casey sand at 261-303 ft. and Mississippi lime at 351-70 ft., TD 420 ft. Discovery well.

Edwards County: Big Chief and Sohio 1 Clayton Bunting, SW SE SE 29-1s-10e, hole trouble at 2,784 ft. Rig skidded 50 ft. N and running casing at 100 ft.

Noah 1 E. West, C S½ SE NW 28-2s-10e, dry at 3,306 ft. Kinkaid 2,190 ft., Cypress 2,930 ft., Benoist 3,062 ft., Aux Vases 3,175 ft., Ste. Genevieve 3,238 ft., McClosky 3,296 to 3,305 ft.

Franklin County: E. S. Adkins 2 Boner, NW NE NW 31-7s-3e, dry at 3,156 ft. Upper Kinkaid 1,602 ft., Cypress 2,424 ft., Benoist 2,666 ft., Aux Vases 2,784 ft., Fredonia 2,830 ft., McClosky 2,833 ft., St. Louis 2,969 ft., Salem 3,003 ft., Warsaw 3,150 ft.

Aetna Oil and Leach 1 U.S.C.&C. SE SE NW 8-6s-4e, dry at 3,199 ft., Menard 2,175 ft., Cypress 2,716 ft., Benoist 2,835 ft., Aux Vases 2,950 ft., Ste. Genevieve 3,008 ft., Fredonia 3,084 ft., St. Louis 3,187 ft.

Hamilton County: Holbert & Leach 1 Leach-Gilpin, C SW NE 14-4s-6e, dry at 3,563 ft., lower Glen Dean 2,771 ft., Cypress 3,086 ft., Aux Vases 3,314 ft., Ste. Genevieve 3,365 ft., McClosky 3,475 ft.

Ohio 1 L. York, NE SW NE 27-4s-7e, dry at 3,348 ft.

Wabash County: Superior 1 V. A. Curtis, NW SW NE 32-1s-14w, dry at 3,147 ft. Lower Menard 2,227 ft., Cypress 2,721 ft., Benoist 2,865 ft., Aux Vases 2,964 ft., Ste. Genevieve 3,028 ft., McClosky 3,142 ft.

Washington County: H. Hubbard 1 Schrieps, NW NW NW 3-1s-4w, dry at 1,455 ft. Glen Dean upper 839 ft., Cypress 1,060 ft., Benoist 1,160 ft., Aux Vases 1,347 ft., Fredonia 1,371 ft.

Wayne County: Kingwood 1 Burkett, SW SW NW 26-1n-5e, dry at 3,153 ft. Lower Kinkaid 1,962 ft., Cypress 2,614 ft., Benoist 2,838 ft., Aux Vases 2,897 ft., Ste. Genevieve 2,945 ft., Fredonia 2,975 ft., McClosky 3,010-14 ft., 3,044-51 ft., and 3,083-86 ft.

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MICHIGAN

Muskegon Discovery Pumps 63 Bbl. Daily

SAGINAW, Mich.—Muskegon Oil Corp. is drilling an offset to its wildcat producer in Muskegon County's Dalton Township, 11n-16w. The discovery, 1 Helen Neubeck, NE SE NW Section 10, has been completed in the Traverse limestone at 1,851 ft., rating 63 bbl. a day, after acid treatment.

Nine tests were on last week's completion report, the list including five dry holes, four of which were wildcat failures. Best producer was C. L. Maguire, Inc., 1 Sherwood, in LeRoy Township, Osceola County, which flowed 224 bbl. in 16 hours after acidizing.

The state Conservation Department announced it has sold oil and gas leases on 26,750 more acres of state-owned land. Bidding centered on land in Aetna and Green townships, Mecosta County and in Home Township, Newaygo County.

Ohio Oil Co., principal operator in Michigan's Reed City field, is moving its Michigan headquarters from Mount Pleasant to Grand Rapids. The Grand Rapids headquarters are to be opened February 1.

MICHIGAN WILDCAT COMPLETIONS

Allegan County, Lee Township: William H.

Clock 1 Burgh, NE SE NE 5-1n-15w, dry in Traverse, TD 1,217 ft.

Muskegon County, Dalton Township: Muskegon Oil Corp. 1 Helen Neubeck, NE SE NW 10-11n-16w, pumping 63 bbl., acidized in Traverse, TD 1,851 ft.

Osceola County, Cedar Township: Sun Oil Co. 1 Levy & Lakie, C S½ SE SE 8-18n-9w, dry, TD 3,907 ft.

Highland Township: C. L. Maguire, Inc., and H. H. Colfield 1 H. Hibma, C N½ NW NE 2-20n-8w, dry in Dundee, TD 4,089 ft.

Osceola Township: Sun Oil Co. 1 F. S. Postal Estate, C S½ SE SE 5-18n-8w, dry, TD 4,225 ft.

APPALACHIAN FIELDS

Pennsylvania Completions Down Due to Weather

PITTSBURGH, Pa.—A fair gas and oil well was completed in Wood County, West Virginia, during the week and in Lewis County, two Gantz sand tests came in as fair gas wells. Southwest Pennsylvania completions were scarce but there are a number of wells now drilling near producing horizons. Completions totaled 26 for the week of which 5 were dry, 16 gas wells and 5 oil producers with a daily initial of 46 bbl.

WEST VIRGINIA

Two wildcats are drilling to the Oriskany in Wood County but they have not yet reached the Devonian.

Another test has reached the Oriskany in the Peytona district of Boone County and has a showing of gas in the top of the sand. Big lime gas in Kanawha and Putnam counties after acidizing is showing very fair results.

CALIFORNIA

Gas Well Is Year's First Discovery

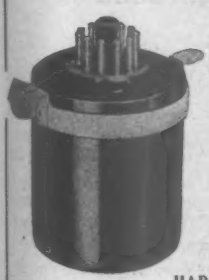
LOS ANGELES, Calif.—Prospectors have started off the new year with a new gas field and within another 30 days it is likely the state may have a new oil field. Two possibilities for the discovery of a new oil field are Continental Oil Co.'s wildcat in the Strand district of Kern County in 18-30s-26e and Standard Oil Co. of California's wildcat in the Polvadero district of Fresno County in 1-21s-16e. In the East Coalinga wildcat area, The Texas Co. 58-21 Southern Pacific, 21-19s-16e, and Standard of California 67-17-E in the Jacalitos area, 17-21s-15e, are in areas that show more than ordinary promise.

The new gas field was found near Chico in Butte County by Richfield Oil Corp. but its importance from a production standpoint is still undetermined. Richfield carried this well to 7,005 ft. and after landing 7-in. casing at 5,275 ft. bridge back to 4,798 ft. and then gun perforated at 4,365-90 ft. Previously the company made a series of formation tests of several intervals below the productive sand with negative results. In Glenn County, near Afton in 34-19n-1w, Richfield has another wildcat which recently showed gas at a daily rate of about 2,000,000 cu. ft. along with salt water.

Chanslor-Canfield Midway Oil Co. appears to stand a good chance of extending the productive limits of the Midway-Sunset field when its 2-2 in Section 2-32s-22e is given a production test within the next several days. This well, a semiwildcat, cored oil sand in the interval at 2,579-2,672 ft. and if there is enough sand present the company should complete a good pumping well. Dwight Vedder has two wells in 18-27s-28e, Mount Poso field, ready for production tests. Both cored good Vedder oil sand. The initial well in this area came in as a gasser and did not show any oil. This time Vedder will blank off the top of the Vedder in the hope of restricting gas production and stimulating crude-oil production.

In the meantime, the field found a short time ago west of the Round Mountain field in Kern County has failed to show much in the way of

Geophysical Transformers



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production as several outposts have been abandoned.

CALIFORNIA WILDCAT COMPLETIONS

Chico wildcat district, Butte County: Richfield 1 Chico, 17-21n-1e, flowed 3,500,000 cu. ft. gas, no oil, 1-in. bean, flowing pressure 750/1,050 lb., shut-in pressure 1,925/1,925 ft., TD 2,7005 ft., PB 4,796 ft., gun perf. 4,365-90 ft., basement material 6,998 ft., comp. in Chico zone of Eocene age.

Cymric wildcat district, Kern County: Standard of California 37 McPhee, 36-29s-21e, abandoned primarily because of complicated mechanical failure, lost drill pipe fish and wash pipe, Miocene 1,403 ft., Pulvinulinella 3,959 ft., Carneros sand 7,540 ft., Phacoides Reef 7,775 ft., TD 8,143 ft., only minor showings recorded.

Poso Creek wildcat district, Kern County: Golden Bear Oil Co. 1 Agey Hunt, 28-27s-27e, dry in barren gray sand, TD 1,982 ft.

Rancho Sobrante wildcat district, Contra Costa County: Standard of California 1 Oursan Community, 6-1n-3w, dry in barren gray Cretaceous shale, TD 4,270 ft., Martinez formation 1,400 ft., Cretaceous 3,960 ft., did not recover drill-pipe fish.

LOUISIANA GULF

White Lake Discovery Is Dual Completion

NEW ORLEANS, La.—Union Oil Co. of California completed the 1-A State, Lease 540, discovery well in White Lake, T-14s-2w, in perforations 10,660-75 ft. as a gas well with some condensate and shut it in before trying to take a gage of the flow. The 2-in. tubing is set 10,558 ft., total depth 12,000 ft., 5½-in. set 10,768 ft. Operator has applied for permit to dual-complete this well with the 8,300-ft. gas sand, and hearing is scheduled in New Orleans on January 20.

Sugarfield Oil Co. has located a second test in the Rosedale field of Iberville Parish, the 1 Slack Bros., Inc., in Section 107-7s-10e. It is scheduled to go to 11,000 ft. The discovery well, 1 Iberville Land & Mortgage Co., was completed in perforations 10,009-12 ft. with a flow of 210 bbl. a day on 7/64-in. choke, several weeks ago.

A new sand was opened at LaPice field in St. James Parish by Shell Oil Co., Inc. 4 Federal Land Bank, flowing 264 bbl. a day on ⅛-in. choke from perforations at 10,136-50 ft., total depth 10,629 ft., 5½-in. casing is set at 10,553 ft. This new sand was logged from 10,132-50 ft. This is first producer completed in this field in many months.

LOUISIANA GULF COAST WILDCAT COMPLETIONS

Acadia Parish: Continental Oil Co. 1 G. T. Duhon, wildcat Mermentau area, 36-10s-2w, dry at 11,607 ft.

Iberia Parish: The Texas Co. 1-C State-Vermilion Bay, Lease 334, in Vermilion Bay, T-14s-6e, dry at 11,886 ft., sand and shale.

Vermilion Parish: Union Oil Co. of California 1-A State-White Lake, Lease 540, discovery well in White Lake, T-14s-2w, TD 12,000 ft., 5½-in. 10,768 ft., completed 12-31-43 as gas-condensate well in perforations 10,660-10,675 ft., and shut in, no gage. It also showed some gas-condensate in perf. at 10,618-42 ft., and showed dry gas in perf. 8,356-72 ft. Waiting on permission to dual complete with 8,300-ft. gas sand.

PERMIAN BASIN

Extension and Discovery Wells Have Good Shows

MIDLAND, Tex., — Two new pools were a possibility in widely separated areas of the Permian basin. In Andrews County, Signal Oil & Gas 1 M. M. Fisher, SW SW Section 25, Block A-35, Public School Land, 3½ miles west of the south edge of the Means pool, was running 7-in. casing to test a show of oil encountered in cores from 4,575 to 4,610 ft., in San Andres lime. Top of the San Andres was called at 4,596 ft., and saturation and porosity were present in two cores. This well is in an area long considered favorable for oil production. It is 1 mile southeast of a well drilled to 4,731 ft. and abandoned as dry after showing oil, and 2 miles south of another dry hole at total depth 4,647 ft., which was plugged back to 4,631 ft. to test a favorable showing.

In Reagan County, 4½ miles south of Big Lake field, Superior Oil Co. and Wiggins and Hyde 1-A University, Section 25, Block 8, University Survey, 4½ miles south of Big Lake field, topped lime at 3,133 ft., cored from 3,141-59 ft., recovering 18 ft. of core, the bottom 10 ft. of which showed porosity and were bleeding oil. The Big Lake field produces from 2,300 to 2,800 ft., and it is presumed that the pay in the new strike is the same as in the Grayson pool, 3 miles east, producing from 3,100 ft.

Andrews County.—Both the Fullerton pool and Mabee pool were given extensions last week. Frankel Bros. 1 University, 1 mile west of Mid-Continent Petroleum 1-B University, extension producer, was testing after acid treatment of 6,000 gal. at total depth of 6,921 ft., an extension for the Fullerton pool. The Mabee pool was offered an extension to the northwest at The Texas Co. 5 J. E. Mabee, SW NE Section 43, Block 40, G& MMB&A Survey, which was running 7-in. casing after coring crystalline dolomite with fractures and oil stains.

WEST TEXAS WILDCAT COMPLETIONS

Cochran County: Seaboard Oil Co. and Tex-Pac Coal & Oil 1 Lloyd Evans, SE SE Sec. 15, Blk. Y, Public School Land, elev. 3,949 ft., San Andres lime 4,170 ft., show oil 4,895-4,912 ft., PB to 4,939 ft., acid 6,000 gal., no results, dry at TD 5,134 ft.

Crockett County: Ben Banner 1 H. L. Bair, C SW S½ N½ Sec. 43, Blk. 1, I&GN Ry. Sur., SO 1,305 ft., dry at TD 2,203 ft.

Gaines County: The Texas Co. 1 Parmer County, 660 ft. from N and W, Lge. 317, Parmer CSL, elev. 3,120 ft., dry at TD 8,097 ft.

Upton County: Kenwood Oil 1 W. H. C. Goode, SE SE SE Sec. 25, Blk. B, HE&WT Ry. Sur., elev. 2,564 ft., Yates sand 2,135 ft., frosted quartz grains 2,150 ft., dry at TD 4,035 ft.

SOUTHEAST NEW MEXICO

HOBBS, N. M.—In the Caprock sector, northwest Lea County, Malco Refineries, Inc. 1 State, 31-12s-32e, rank wildcat, indicated possible new field when it showed oil after drilling plug from 5½-in. casing cemented at 2,995 ft. Some water was also found with the oil, but observers estimate that the well is capable of making 20 bbl. per day. Bad weather has hindered operations, and no further attempts have been made to make a test of the possibilities. Robert E. McKee 1 Spencer-State, 3-19s-29e, Eddy County wildcat, was drilling below 2,560 ft. after testing a section from 2,197 to 2,209 ft. from which was bailed 6 bbl. oil in 15 hours.

SOUTHEAST NEW MEXICO WILDCAT COMPLETIONS

Eddy County: P. B. English 1 Hinkle, 660 ft. from N and E, 22-19s-31e, dry at TD 2,551 ft.

Lea County: N. G. Penrose, Inc. 1 State, NE SW 11-15s-35e, elev. 3,983 ft., anhydrite 1,950 ft., salt 2,060 ft., white lime 4,600 ft., dry at TD 5,545 ft.

OKLAHOMA

Cottingham Test Coring Ahead in Tight Sand

LATE last week Carter Oil Co. 1 Cottingham was running the core barrel at 10,647-10,652 ft. The core had not been recovered on last report but cuttings revealed the same tight stained dolomitic sand as shown by the first cores. Top of the sand is 10,633 ft., with an additional sandy streak at 10,628 ft. also showing oil. The 1 Johnson ranch in 13-8n-4w, was last drilling below 9,575 ft. in chalky lime. There have been no shows of water in either test.

Stephens County.—Gulf Oil Corp.'s deep wildcat, 1 Bobbie Springs, in NW NW SW 16-2n-7w, southeast of the town of Marlow, was preparing to run a drill-stem test at 9,292-9,312 ft. after plugging back to 9,340 ft. from 10,006 ft., total depth. Magnolia Petroleum Co. and Frank Buttram are contributors to the test.

Operations in a number of areas are beginning to get under way again after heavy snows. In the West Edmond pool of Oklahoma County, two tests that will extend south boundary were nearing completion. At the extreme southwest Herbert J. Schmitz 1 Meeker, NE NW 6-13n-4w, shut off salt water and made new perforations at 6,932-65 ft. It was then acidized and flowed 100 bbl. of fluid, cutting

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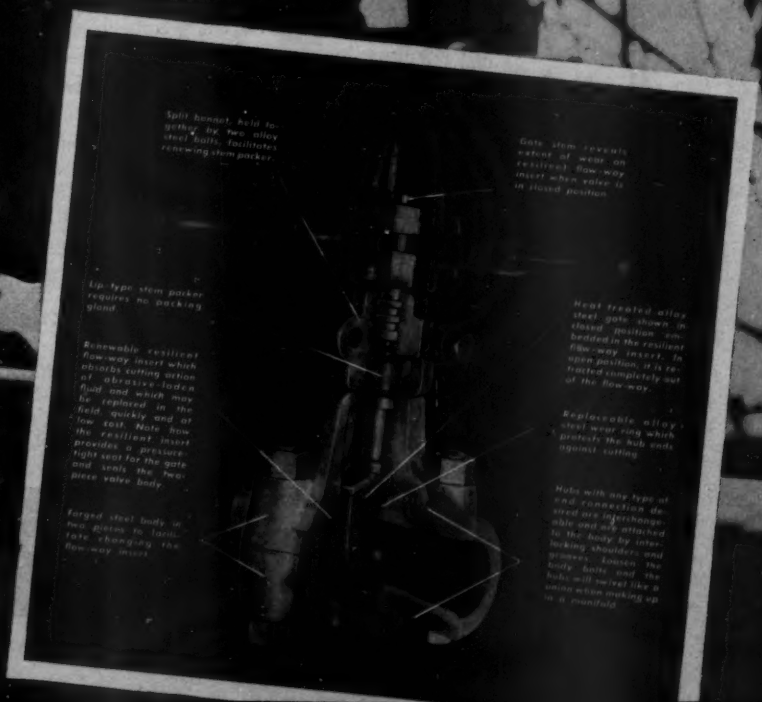
Split bonnet, held together by two alloy steel bolts, facilitates renewing stem packer.
Gate stem reveals extent of wear on resilient flow-way insert when valve is in closed position.
Lip-type stem packer requires no packing gland.
Renewable resilient flow-way insert which absorbs cutting action of abrasive-laden fluid and which may be replaced in the field, quickly and at low cost. Note how the resilient insert provides a pressure-tight seat for the gate and seals the two-piece valve body.
Heat treated alloy steel gate shown in closed position embedded in the resilient flow-way insert. In open position, it is retracted completely out of the flow-way.
Replaceable alloy steel wear ring which protects the hub ends against cutting.
Forged steel body in two pieces to facilitate changing the flow-way insert.
Hubs with any type of end connection designed are interchangeable and are attached to the body by interlocking shoulders and grooves. Loosen the body bolts and the hubs will swivel like a union action making up on a manifold.

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some water, into tanks. On the southeast tip of the field, Sohio Petroleum Co. 1 Specht, NE NW 5-13n-4w, had total depth at 7,198 ft. and set pipe at 6,964 ft.

SOUTHWEST TEXAS

Wildcats Are Active Throughout Southwest

CORPUS CHRISTI, Tex.—Although activity in most Texas areas was slowed considerably last week by bad weather, the lower Gulf Coast and South Texas areas continued to contribute an outstanding number of new fields and new sands in older areas.

Continental Oil Co. was preparing for final completion at the 1 Somerset Land & Cattle Co., wildcat discovery well in TTRR Survey 319, 15 miles southwest of George West in Live Oak County. Heater and separator were set up for a high-pressure gas-condensate well from open hole at 8,144-93 ft. where it had on earlier test flowed 24 bbl. per day through ⅛-in. bottom-hole and ¼-in. top chokes; 2-in. tubing was set at 8,085 ft. Total depth is 9,547 ft.; hole is plugged back to 8,193 ft. with 7-in. casing set to 8,144 ft.

A new pay was opened by Hewit & Dougherty's 7-A Rooke at the Rooke field, Refugio-San Patricio counties. The new pay sand flowed 155 bbl. a day net of 40.5-gravity oil plus 34 per cent salt water on ¼-in. choke from perforations at 6,269-73 ft. The well had previously flowed 76 bbl. per day net oil plus 55 per cent water from the regular pay in perforations at 7,134-39 ft.

A new field is indicated about 6 miles south of Bruni in Webb County, where Charles E. Fraser, Inc. 2 A. M. Bruni estate, NW NE SW C&M Survery 447, A-975, recovered 450 ft. of pipe-line oil on drill-stem test at 1,808-12 ft., total depth 1,812 ft. It had previously shown dry gas at 1,796-1,803 ft.

LOWER GULF COAST WILDCAT COMPLETIONS

Bee County: H. B. Zachry 1 Phillip P. Brown et al, discovery well in T. J. Butler Sur., 3 mi. W of Pettus and just W of old Cosden field, top pay 3,639 ft., TD 3,649 ft., 5½-in. 3,647 ft., perf. 3,639-45 ft., 2-in. set 3,620 ft., comp. 12-22-43, PT 38 bbl. day ½-in. choke, GOR 815-1, TP 225 lb., CP 1,000 lb., gravity 43.7, no water.

Sun Oil Co. 1 Mrs. E. B. Tuttle, new pay discovery at Blanconia field, in J. M. Keating Sur., Frio gas sand pay 4,087-4,115 ft., TD 5,095 ft., 5½-in. 4,149 ft., perf. 4,089-4,105 ft., comp. 12-29-43, PT 570,000 cu. ft. wet gas per day on ½-in. choke, TP 1,565 lb., CP 1,630 lb., no water.

Jim Wells County: Atlantic 1 Della R. Bishop, in Los Presenos de Abajo grant, 2 mi. W of Bentonville field, dry at 5,600 ft.

Sun Oil Co. 1 A. T. Canales, discovery well 3½ mi. SE of Seeligson oil field, in CCSD&RGNG Sur. 343, top pay sand 7,221 ft., TD 7,237 ft., 5½-in. 7,237 ft., perf. 7,233-35½ ft., comp. 1-6-44, PT 174 bbl. per day, 3/32-in., TP 1,250 lb., CP 2,000 lb., gravity 39.1, no water.

Karnes County: Southwood Oil Co., Inc., et al 1 Cannon estate, in Antonio Lombrano Sur. A-175, about 2 mi. NE of Karnes City, dry at 5,500 ft.

Refugio County: Hewit & Dougherty 1 James Hynes, in Manuel Arocha grant A-79, 2 mi. NW of Refugio field, dry at 6,343 ft.

Hewit & Dougherty 7-A Birdie D. Rooke, new pay discovery at Rooke field, on Blk. 28, Subd. C of La Rosa ranch, in J. M. and J. M. Aldrete grant, opened new sand on dual completion, new pay perf. 6,269-73 ft., TD 7,145 ft., 5½-in. 7,145 ft., flow 155 bbl. day net oil, plus 34 per cent salt water on ¼-in. choke, 850 lb. WP on casing, gravity 40.5.

SOUTH TEXAS WILDCAT COMPLETIONS

Duval County: Gordon W. Johnson 1 Sidney Adami et al, in Arnold & Barrett Sur. 47, A-768, 3½ mi. SE of Adami field, dry at 1,320 ft.

Taylor Ref. Co. 5-G P. G. de Garcia, in Blackstone-Hardeman Sur. A-288, new pay discovery well at Cadena field, opened new sand in upper pay on dual-completion, new pay topped 4,428 ft., perf. 4,428-34 ft., PT 103 bbl. per day on 9/64-in. choke, CP 500 lb., GOR 639:1, gravity 44.2, no water, TD 4,557 ft., 7-in. 4,556 ft.

Live Oak County: Charles E. Fraser, Inc. 1 Ila Atkinson et al, in Louis Ayers L&L Sur. 3, A-2, 3 mi. NE of Calliham, dry at 7,015 ft.

H. B. Zachry Co. 1 J. W. Nichols, Blk. 13, Nichols ranch subdn., Patrick Henry Sur. A-12, 4 mi. NW of Three Rivers, dry at 7,387 ft.

Zapata County: Dan Auld 1 M. A. Hirsch estate, in SE GC&SF Sur. 595, 2 mi. SE of old shallow Charco Redondo field, dry at 2,008 ft.

Venture Petroleum Corp. et al 1 San Juana P. de Vela, Blk. 1, Jamison subd., Porc. 21, new pay discovery at Lopeno field, gas sand 2,752-70 ft., TD 2,770 ft., 7-in. 2,752 ft., no perforations, comp. 12-30-43, PT 7,800,000 ft. gas per day, open flow, 1,120-lb. SIP (showed TP 820 lb., CP 850 lb., while flowing on 9/64-in. choke).

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ROCKY MOUNTAIN

Tensleep Discovery Starts Play at Garland Dome

DENVER, Colo. — Reports of an oil discovery in the Tensleep lime on the southwest flank of the Garland dome, Big Horn County, Wyoming, started a quick-action campaign by major oil companies reminiscent of wildcat plays of more hectic times and within a few days practically every tract considered worth while was committed. The well that started the rush is General Petroleum Corp. 1 Howell, Lot 63-56n-97w, approximately SW SE Section 32). Last reports gave the drilling depth at 4,250 ft., where it was feeling for the top of the lime. The wildcat was being closely watched when a core barrel was run and when it came out of the hole the rumor immediately spread

that the first foot of core recovered came out bleeding with oil. Operators immediately made it a "tight" hole and ceased giving out information. Previously the drill is reported to have entered the Embar at 4,162 ft. and to have encountered good saturation at 4,217-50 ft.

Little Grass Creek. — Continental Oil Co. wildcat to the Tensleep on Little Grass Creek, Hot Springs County, adjoining the Grass Creek field, had good indications of closure in lower horizons when a drill-stem test showed 800,000 cu. ft. of gas in the Muddy sand. Sand was at 3,580-3,615 ft. Tester was set at 3,575 ft. and was open 15 minutes. This is the first well to go below the Frontier, which produced gas for a time in that horizon from two wells.

WYOMING WILDCAT COMPLETIONS

Canyon Creek, Sweetwater County: Weststates Petroleum Corp. 2 Horne, C NW 11-12n-101w, TD 2,789 ft., dry, tested Wasatch formation.

MONTANA WILDCAT COMPLETIONS

Farmington Block, Pondera County: Texas Co. 1 State, SE NW SE, 16-25n-4w, TD 1,926 ft., no Sunburst sand; Yellow shale 1,658, Ribbon sand 1,760-1,827, Ellis 1,827, Madison 1,910, SO 1,910-14 ft., Sulfur water at 1,918-26 ft., dry.

OHIO, KENTUCKY

Wildcat Makes Large Area Look Favorable

ZANESVILLE, Ohio. — A wildcat gaging 4,000,000 cu. ft. was completed on the C. B. Richardson tract in Section 10, Bloom Township, Morgan County, by H. K. Porter Co. of Pittsburgh, Pa. The well is 3 miles east of the south end of the Brush Creek field, and makes a large area look favorable. The Clinton sand was found at 4,321-50 ft. and the well rocked to 1,125 lb. in 12 hours.

Two tests to find gas east of the Wellston field in Jackson County were dry. The Foraker et al well, 3 miles east of the field in Section 10, Milton Township, found a show of gas in both the Clinton and Medina sands, but not sufficient to encourage further drilling. H. K. Porter's test 6 miles east of the field in Section 36, Madison Township, found no shows in the sand.

OHIO WILDCAT COMPLETIONS

Jackson County, Madison Township: H. K. Porter 1 L. O. Jones, Sec. 36, Clinton 3,226-3,234 ft., dry, TD 3,374 ft.

Milton Township: Foraker et al 1 Superior Colliery Co., Sec. 10, Clinton 2,766-2,774 ft., dry, TD 2,954 ft.

Morgan County, Bloom Township: H. K. Porter 1 C. B. Richardson, Sec. 10, Clinton 4,321-50 ft., 4,000,000 cu. ft., TD 4,360 ft.

EASTERN KENTUCKY

ASHLAND, Ky.—Gas-well completions hold general attention in eastern Kentucky this week while drilling activities display a slight increase in the over-all picture. A dozen wells were drilled in and the reports show that two of them bettered the million mark. Six were in Pike County, five in Martin County and one in Floyd County. Eleven were producers, which showed a total of 4,765,000 cu. ft. of gas.

WESTERN KENTUCKY WILDCAT COMPLETIONS

Henderson County: Sun 1 G. L. Crawford, 1½ mi. N of Corydon, dry at 2,733 ft. Menard 1,724 ft. Vienna 1,880 ft., Barlow 2,284 ft., Ste. Genevieve 2,633 ft. McClosky 2,656-70 ft.

E. P. Jarvis and Al. Marcell 1 O. W. Rash heirs, 2 mi. E of Henderson, dry at 2,512 ft. Menard 1,521 ft., Bethel lime 2,215-29 ft., Bethel sand 2,229 ft., Renault 2,274 ft., McClosky 2,394-97 ft. and 2,436-41 ft.

Hopkins County: Pure 1 G. B. Hewlett, 1 mi. E of Hanson, dry at 3,038 ft. Menard 2,023 ft., Barlow 2,534 ft., Ste. Genevieve 2,722 ft.

INDIANA

EVANSVILLE, Ind. — Three small oil wells and a dry hole made up the completion report for Indiana in the past week. Gibson and Spencer counties supplied the oil wells and Randolph County the dry hole.

INDIANA WILDCAT COMPLETION

Randolph County: Homer L. Simmons 1 Potter, NE NE NW 15-21n-14e, dry at 1,095 ft. Trenton lime top at 1,020 ft., shot at 1,038-45 ft.

KANSAS

Stafford Wildcat May Link Three Pools

SOUTHEASTERN Stafford County apparently had a new pool early this week at Atlantic Refining Co. 1 Neil, SW SW NE 27-24-12w, about 3 miles south and west of the Stafford pool. A 30-minute drill-stem test at 4,232-44 ft. put 1,700 ft. of oil in the hole. Pay zone is the Arbuckle lime.

Barton County.—Skelly Oil Co. 1 C. E. Putman, SE NW SW 31-16-13w, east of the new Barrett pool and a possible connecting link of Barrett, Trapp and Ainsworth, was showing a small amount of oil after shooting and three acid treatments in the Arbuckle at 3,424 ft. Pipe was set at 3,425 ft.

Trego County.—J. M. Huber and Barnett Drilling Co. 1 Cotton, W½ NE NE 2-12-21w, was perforating in the Arbuckle at 3,908 ft. Last week the well was reported to be ready for a test of that formation after finding a show of oil. A core at 3,914-17 ft. recovered 1½ ft. of porosity and saturation and a second core at 3,917-27 ft. recovered 9 ft. of porosity and saturation. A core at 3,927-36 ft. was not recovered and 5-in. pipe was set to 3,936 ft.

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N. CENTRAL TEXAS

Young County Wildcat Showing Oil

WICHITA FALLS, Tex.—L. T. Burns 1 Nora Finch, Section 38, TE&L Survey, 4 miles southwest of Orth, indicated a new Mississippian lime pool when it showed oil-cut mud on drill-stem test from 4,872-78 ft. The test, bottomed at 4,917 ft., topped the Mississippian at 4,857 ft., according to driller's call, and had show of oil from 4,864 ft. to 4,879 ft. Electric log was made, and 7-in. casing was cemented at total depth, which will be perforated to test the shows. Production from Caddo lime in the Padgitt pool, which is productive from the Mississippian, was indicated at Shell Oil 1-B Padgitt, Section 334, TE&L Survey, east of the field proper. Casing in this well was perforated with 15 shots from 4,190-4,208 ft., and with 24 shots from 4,195-4,208 ft., and the Caddo lime treated with 2,000 gal. acid. The well then flowed out the oil load and acid water and died, and was swabbing in an effort to revive.

King County.—In the Bateman Ranch pool, Humble Oil & Refining 3 Bateman, northwest of the discovery, was bailing oil from lime at 3,652-60 ft. The 2 Bateman was still shut down for orders after it tested salt water and was plugged back to 3,670 ft. and drilled out to 3,705 ft., perforating with 60 shots from 3,692 to 3,703 ft., showing a small amount of oil after 500-gal. acid treatment.

Wichita County.—Two new wells were being completed in the West pool, just 1½ miles west of Wichita Falls. Continental Oil 1 Barber, Cooke Survey, total depth 4,280 ft., flowed 41.6 bbl. oil in 8 hours through 20/64-in. choke on tubing from pay at 4,240-72 ft. Ohio Oil 2 Barber, extending the pool one location northeast, was flowing 2 bbl. per hour from 4,240-82 ft. These are the sixth and seventh producers for the new pool.

NORTH TEXAS WILDCAT COMPLETIONS

Archer County: S. D. Johnson 1 C. E. Carte, C SE Sec. 38, Blk. 5, Clark & Plumb subd., dry, TD 920 ft.

WEST CENTRAL TEXAS

ABILENE, Tex.—Interest in the West Central Texas district has shifted to Stephens County, which has several deep tests in progress, nearing critical depths. Two and one-half miles southeast of Breckenridge, Hanlon Gasoline Co. 1 J. M. Carlisle, Section 25, Block 5, T&P Ry. Survey, total depth 4,444 ft., was attempting to complete in Ellenburger lime. Elevation of test at 1,264 ft. Two miles north of Ivan, Shell Oil Co., Inc. 1 O. E. Allen, Section 14, Block 2, SP Ry. Survey, another Ellenburger project, had drilled to 3,980 ft., and was reported to be setting casing.

Jones County.—Disappointment for the Hardy pool, 7 miles north of Anson, was registered when Allen Guiberson, Jr., et al 1 Sealey was dry at 3,750 ft. without showing anything in the Canyon sand that produces in the discovery. North of the discovery, Thomas D. Humphrey 1 Bates was drilling ahead below 3,990 ft. after finding nothing in the Canyon horizon.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Jones County: S. A. Guiberson, Jr. 1 M. R. Sealy, 330 ft. from N and W, 60-ac. tract, Sec. 3, M. R. Long Sur., elev. 1,626 ft., dry, TD 3,750 ft.

S. C. Herring 1 R. E. Foster, 330 ft. from S and E, 120-ac. tract, Sec. 49, Orphan Asylum Land, dry, TD 2,525 ft.

O. P. Leonard 1 H. A. Snively, 330 ft. from S and E, SW Sec. 45, Blk. 14, T&P Ry. Sur., elev., 1,706 ft., dry, TD 1,921 ft.

LA.-ARK.

Tensas Parish Wildcat Is Wilcox Discovery

SHREVEPORT, La.—Chicago Mill & Lumber Co.'s Wilcox discovery in NE SE 12-11n-9e, 2 miles north of the Holly Ridge pool, was ready for completion after flowing 5 bbl. of oil an hour through ¼-in. choke in the sand at 3,012-24 ft. Total depth was in the Marine Tuscaloosa, producing zone at Holly Ridge, at 8,463 ft. Further production tests will be made when adequate storage is erected.

Columbia County.—Phillips Petroleum Co. 1 J. S. Abercrombie in 13-18s-22w, blew out of control last week with an estimated 3,000,000 cu. ft. of gas and 300 bbl. of distillate a day. All efforts to kill the well with a mixture of mud and cottonseed meal had failed. Flares and drilling rigs were shut down over a wide area in the Dorcheat and Macedonia pools. Location of the wildcat is approximately midway between the two fields and will prove up the intervening area.

LEGAL.

UNITED STATES DEPARTMENT OF AGRICULTURE, Forest Service, Jackson, Mississippi, January 20, 1944. Sealed bids in triplicate will be received until 2:00 P.M. Central Time, February 22, 1944, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on five parcels of national forest land located in Township 6 North, Range 1 East, Sections 22, 23, 28, and 35, in Franklin County, Mississippi, containing in all approximately 618 acres. Bids will be received on any portion thereof or on the entire acreage being offered. Award of lease or leases will be made on the bid or combination of bids bringing the greatest return to the government. Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the Forest Supervisor, Masonic Building, Jackson, Mississippi.

Wildcat Completions and Discoveries

ALTHOUGH a number of promising tests did not complete last week, wildcat discoveries made a fair showing. There were seven oil wells, including three new pay wells, one distillate and four gas wells finished.

The Texas Lower Gulf Coast area ranked first with two new wells and one new pay zone in the Rooke field. In Bee County, H. B. Zachry 1 Brown established sand production 3 miles west of the Pettus field. Oil was 43.7 gravity and potential was 38 bbl. a day through ½-in. choke. In Jim Wells County, 3½ miles southeast of the Seeligson field, Sun Oil Co. 1 Canales flowed 174 bbl. of 39-gravity oil a day through 3/32-in. choke. Top of the pay sand was 7,221 ft. In the Rooke field, Refugio County, Hewitt & Dougherty 7-A Rooke was finished as a dual completion, with the new and second pay at 6,269-73 ft. The well flowed 155 bbl. of oil a day through ½-in. choke on tubing.

In Southwest Texas a new pay zone was found at two pools. Taylor Refining Co. brought in a dual completion at the Cadena field, Duval County, with a new and shallower sand at 4,428 ft. Total depth is 4,557 ft. in the lower sand. Initial potential was 103 bbl. a day through choke. In Zapata County, Venture Petroleum Corp. found a new gas sand in the Lopeno field at 2,752-70 ft.

WILDCAT COMPLETIONS

	Week ended January 15, 1944					Cumulative total for 1944				
	Oil	Distillate	Gas	Dry	Total	Oil	Distillate	Gas	Dry	Total
Ohio	0	0	1	2	3	0	0	1	3	4
Indiana	0	0	0	0	0	0	0	0	0	0
Kentucky	0	0	0	3	3	0	0	0	6	6
Illinois	1	0	0	10	11	1	0	0	15	16
Michigan	1	0	0	4	5	1	0	0	6	7
Kansas	0	0	0	6	6	0	0	0	12	12
Nebraska-Missouri-Iowa	0	0	0	0	0	0	0	0	3	3
Oklahoma	0	0	1	4	5	0	0	1	6	7
Texas:										
North Central	0	0	0	4	4	1	0	0	12	13
West	0	0	0	3	3	0	0	0	5	5
Panhandle	0	0	0	0	0	0	0	0	0	0
East	0	0	0	7	7	0	0	0	13	13
Gulf Coast	3	0	1	3	7	3	0	1	6	10
Southwest	2	0	0	6	8	3	0	0	14	17
Total	5	0	1	23	29	7	0	1	50	58
Louisiana:										
North	0	0	0	0	0	0	0	0	0	0
Gulf Coast	0	1	0	2	3	0	1	0	4	5
Total	0	1	0	2	3	0	1	0	4	5
Arkansas	0	0	0	0	0	0	0	0	0	0
Mississippi and Southeast	0	0	0	0	0	0	0	0	7	7
Montana	0	0	0	1	1	0	0	0	1	1
Wyoming	0	0	0	1	1	0	0	0	1	1
Colorado, Utah	0	0	0	0	0	0	0	0	0	0
New Mexico	0	0	0	2	2	0	0	0	4	4
California	0	0	1	3	4	0	0	1	6	9
Total United States	7	1	4	61	73	9	1	4	126	140
Total previous week	2	0	0	65	67					

CANADIAN FIELDS

Turner Valley Extension Opens Up 6-10 Locations

CHATHAM, Ont.—On the east flank of the North Turner Valley extension, Northend Petroleums 1, LSD 12, 9-21-3w5, once thought too far east for production, is a fair commercial well in the upper Madison. The well got the Madison at 8,928 ft. and was shut down for over a year at 8,949 ft. until arrangements were made with Royalite Oil Co. to drill deeper. The test got the upper porous lime at 9,186 ft. with 90 ft. of porosity and on a 7-hour test with 270 lb. pressure. Befor acidization it flowed 20 bbl. an hour. Production at this point will extend the drilling area to the east from 6 to 10 locations

Marginal wells. — Tests in the neglected marginal areas of West Central Turner Valley, which are being financially assisted through the government-sponsored Wartime Oils, are in several instances nearing completion. The government-sponsored company advanced money toward drilling costs, repayable out of production. Up to the close of 1943 some 11 wells had been thus assisted, and, on the basis of earlier completions in this area, were expected to average, on quota, about 150 bbl. daily. The first completion, Okalta Oils 12, LSD 16, 24-19-3w5, has been completed with initial production of 277 bbl. daily, and several other wells are testing. In addition to two tests finished and one nearing completion, the Okalta company has eight new locations in this area while other companies have seven wells drilling or located.

Jumping Pound. — Shell-Norman 1, LSD 5, 22-24-5w5, Canada's record 12,056-ft. deep test on the Jumping Pound structure west of Calgary, developed sulfur water in three porous zones of the Madison and has plugged back to test the Blairmore formation at 8,220 to 8,315 ft.

CRUDE-OIL PRICES

Representative selected crude prices from all sections of the country appear below:

East Texas	$1.20
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.98
Bradford, Pennsylvania	2.00
Van, Van Zandt County, Texas*	1.00

*No change since 5-21-41.

Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.89	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.19	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

* Includes Lea County, New Mexico.

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Among the Drilling Contractors

Monday Oil Co., San Antonio, Tex., is the contractor on W. Earl Rowe 1 Charles Peters, wildcat 330 ft. northeast and 330 ft. southeast at right angles from westerly corner of 200-acre tract, Edwin Morehouse Survey A-231, 6 miles east of Clareville in Bee County, Texas. This is a 4,500-ft. Vicksburg test.

C. C. Gilger, Houston, Tex., has contracted to drill L. M. Bradford and Herschel Scivally 1 Myer, wildcat in the Miles Reed Survey, of Marion County, Texas, southwest of the Rodessa pool.

Gibson Drilling Co., Los Angeles, Calif., has recently completed four wells for Atlantic Oil Co. at South Belridge field, California, and is moving equipment to Maricopa flats on a well for Otis Hoyt, a 3,000-ft. test. The well will be the 1 Bronco.

M. L. Massingill, San Antonio, Tex., will drill The Texas Co. 2-B E. L. Armstrong et al test in the Armstrong field of Jim Hogg County, Texas. Pits have been dug and location cleared ready for the rig. This test is 1,273 ft. west of the 1-B Armstrong, southwest extension well, and is a 5,000-ft. hole.

Morris-Hamilton Drilling Co., Houston, Tex., has the contracts to drill Gulf Refining Co. 1 and 2 Gray et al unit tests in the Vinton field of Calcasieu Parish, Louisiana. Both are scheduled to be completed in Frio pay sand.

Markley-Bankhead has the contract on Amerada Petroleum Co. 1 Emilie Kidder unit, the company's second test in the Arnaudville area of St. Martin Parish, Louisiana, in 44-7s-5e. The test was spudded last week and is drilling below 4,000 ft. It is an 11,000-ft. contract.

Loffland Brothers, Houston, Tex., received contract for Amerada Petroleum Corp. 7 State-Lake Chicot, Lease 411, in the Lake Chicot area of St. Martin Parish, Louisiana, 25-11s-9c. The well is contracted to 11,000 ft.

Brewster-Bartle Drilling Co., Houston, Tex., contractor on Navarro Oil Co. 1 Edward R. Bolton et al, Block 88, Henry Bond Survey A-75, about 3 miles southeast of Saron townsite in Trinity County, Texas, is having trouble getting rig to the location due to wet grounds. This is a Wilcox wildcat.

Arrow Drilling Co., Tulsa, will drill a deep test for Northern Ordnance Co. on the Calyton & Johnson ranch in Borden County, Texas, 330 ft. from north and west, Section 32, Block 31-4n, T&P Ry. Survey. It is to be a deep exploration.

Newman Brothers Drilling Co., San Antonio, Tex., has finished a 5,600-ft. dry hole for Atlantic Refining Co. at the 1 Bishop, in Jim Wells County, Texas, and was moving the rig to 2-A Welder, in Duval County, Texas, for the same company to drill a 4,500-ft. wildcat. The contractor was also completing 8 Weil for Sun Oil Co. in the Weil field, Jim Hogg County, Texas, as a producer at 5,050 ft. and was preparing to skid rig to 9 Weil.

MBK Drilling Co. has been awarded drilling contract on the Melville G. Penrose, Inc. 1 Brownfield, a 5,500-ft. wildcat in southeastern Yoakum County, Texas. Location is C NE NE Section 563, Block D, John H. Gibson Survey. It is 2 miles southeast of production in the Ownby pool and 2½

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miles east and slightly north of the Waples-Platter district. Operations are expected to start within a week.

Allen & Morris, San Antonio, Tex., has been awarded contract for 1 J. F. Wood, Wilcox test in Slick-Wilcox field of Goliad County, Texas. Contractor is moving in rig from the 1 Jank dry hole. This is a 7,700-ft. test in Louis Von Roeder Survey A-285.

Claude McQueen, drilling contractor of Rushville, Mo., has the contract on a test which will be drilled by Cities Service Oil Co., in the Tarkio pool, of Atchison County, Missouri. Contractor was spudding in for the test, the 1 Wallace Watkins, 660 ft. south of 2 Cook, which was drilled as a southeast offset to 1 Cook discovery well. Location is C NE SW NW 32-65n-39w.

Bill Lewis is the drilling contractor and was rigging up for a test Great Lakes Carbon Co. will drill in White County, Illinois. The well is the 3 W. L. and V. G. Miller, in SW NW NE 28-6s-10e. The same operator was rigging up on 6 W. L. and V. G. Miller, in SE NW NE 28-6s-10e, with **N. V. Duncan, Inc.,** as contractor.

Three Companies Announce Advances in Crude Prices

Advances in prices paid for crude oil have been announced by three companies in Arkansas and Louisiana, acting on authorization of the Office of Price Administration.

Standard Oil Co. of Louisiana posted the following prices, effective January 12, in the Louisiana fields named: Holly Ridge, 40 gravity and above, $1.18; 24 gravity, 86 cents. Bayou des Allemands, Branch, Hope Villa, Krotz Springs, Lake Chicot, Lewisburg, Napoleonville, Raceland, Reddell and Rosedale fields, 40 gravity and above, $1.30; 20 gravity, 90 cents. These postings carry a differential of 2 cents for each degree variation.

Phillips Petroleum Co. increased its posted price for Smackover heavy crude oil in Arkansas from 83 cents a barrel to 98 cents. The new price is effective as of January 12.

Lion Oil Refining Co. announced the following prices, effective as of January 12 for sweet crude in the El Dorado and the West and South Rainbow fields (Snow Hill, Mount Holly, and Shuler-Morgan sand); 40 gravity and above, $1.18, with a differential of 2 cents for each degree of variation in gravity. For sour crude (Reynolds lime, Jones sand, Shuler, Ark., and Mount Holly), 10 cents a barrel less than for sweet crude. Heavy Smackover, 98 cents.

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PERSONALS

E. D. SMITH

Magnolia Production Manager Started as Field Roustabout

TWENTY-SIX years of service with Magnolia Petroleum Co., Dallas, Tex., operating affiliate of Socony-Vacuum Oil Co., Inc., supply the background of experience and training that qualified E. D. Smith for election to a vice presidency and promotion to manager of the production department.

"Long years of active participation in all activities of the petroleum industry well qualify Smith to direct the producing division of the company," declared D. A. Little, president of Magnolia, when the promotion was announced last week. "His personal knowledge of every phase of production work from roustabout to vice president will enable him to carry on successfully the newer responsibilities that are his," Little concluded.

Smith first entered the oil business in the Pennsylvania Grade area, accepting employment with South Penn Oil Co. as a roustabout. He joined Magnolia Petroleum Co. October 10, 1918, as foreman in the Augusta, Kans., producing district. He was promoted to superintendent of the Cushing district in September 1919 and on January 1, 1935, was made division superintendent. He became assistant manager of the general producing division for Magnolia March 1, 1939.

The vacancy which Smith was elected to fill in Magnolia's executive department was created by retirement of M. J. McLaughlin.

C. L. Cornelius, of Gulf Oil Corp., is the new president of Midland (Tex.) Oil Scouts Association. Other officers chosen: Vice presidents, **Arvid A. Jones,** Atlantic Refining Co., and **Joseph G. Sauer,** Cities Service Oil Co.; secretary, **Orvelle L. McNew,** Amerada Petroleum Corp.; executive committee, **Paul R. Martin,** Pure Oil Co.; **James R. Maedgen,** Skelly Oil Co.; **Clinton W. Ledebur,** Forest Development Corp.; **James S. Meriwether,** Shell Oil Co., Inc.

J. R. Hickman has been promoted to manager of drilling operations for Magnolia Petroleum Co. in Kansas, succeeding **Joseph D. Triplett,** who retired January 1.

O. C. Cash, tax commissioner for Stanolind Oil & Gas Co., Tulsa, was elected general chairman of the standing committee on state and local taxation of Mid-Continent Oil and Gas Association, which met last week in Fort Worth, Tex. **Frank Shriver,** Shell Oil Co., Inc., Houston, Tex., was chosen general vice chairman.

Fred H. Wilcox, for several years district geologist for Magnolia Petroleum Co., at Midland, Tex., has been transferred to the main office at Dallas, Tex. **H. A. (Bert) Hemphill,** who has been assistant to Wilcox at Midland, assumes the duties of district geologist. Both Wilcox and Hemphill are past presidents of the West Texas Geological Society.

Joe Markley, geologist for The Texas Co. in the Fort Worth, Tex., division office, was elected president of the Fort Worth Geological Society at the annual meeting January 12. **Willard Gill,** Pure Oil Co., was chosen vice president, and **Spencer Normand,** Independent Exploration Co., was elected secretary-treasurer.

Martin F. Muench, for 4 years land man for The Texas Co. at Midland, Tex., has been transferred to Abilene, Tex., where he will be in charge of scouting and leasing in the West Central Texas district. **Ed L. Zihlman,** former scout and land man at Abilene, has been moved to Wichita Falls, Tex., where he will be district land man, succeeding **Warren T. Bostwick,** who has been transferred to Denver, Colo., as division land man in that area. **W. E. (Gene) Price,** former scout at Midland, has succeeded Muench as land man.

Dan Cameron, district scout for Carter Oil Co. at Mattoon, Ill., has been granted leave of absence for military service.

Earle W. Webb, president of Ethyl Corp., of Stamford, Conn., was married last week in the Collegiate Church of St. Nicholas, N. Y., to Mrs. Lilla Adelaide Berbecker.

M. C. Dupress, Ashland Oil & Refining Co.; **W. W. Tennant,** Standard Oil Co. of Louisiana; **A. W. Frey,** National Oil Tranport Corp.; **Parker Wise,** Socony-Vacuum Oil Co., Inc., and **A. L. Christy,** Pure Oil Co., have been appointed members of ODT's new Inland Waterway Carriers' Advisory Committee.

George H. Mettam, District 1 refining director since last spring, has returned to his post with Standard Oil Co. of New Jersey. Mettam is assistant general manager of refineries and manager of the New Jersey works.

Don R. Knowlton, director of production for Petroleum Administration for War in Washington, D. C., is on an extended leave of absence, vacationing in Florida.

Walter L. Goldston, independent oil operator, was elected chairman of the board of directors of University State Bank, Houston, Tex., at the annual meeting of the board last week. The office is a new one.

Dr. E. H. Sellards, director of Texas Bureau of Economic Geology, is authority for the statement that geologists are honest. For more than 15 years the bureau has loaned copies of its rare out-of-print publications—and has never lost one, Dr. Sellards reports.

John B. Hawley, Jr., head of Northern Ordnance, Inc., is believed to have splintered some records as a wildcatter in the Southwest. In the first 11 months of 1943 he drilled 88 tests. Out of the total there were 21 producers of oil and gas. He says his company, which manufacturers naval gun mounts, entered the oil business to provide employment for its workmen after the war.

K. L. Walter, a member of a geological party making investigations in South America for the past year, has returned to his home in Denver, Colo. **Harve Loomis,** Longmont Colo., another member of the party, is returning by boat on account of sickness. **Glen Ruby,** Los Angeles, Calif., geologist, is staying in Brazil in charge of the party. **Everett S. Shaw,** Denver, will return in about 6 months. The crew is working for the United Geophysical Corp., which is under contract to Corporation de Fomento, a branch of the Chilean Government. The party was stationed on the Straits of Magellan, and worked down to Terra del Fuego, the farthest south of continental land.

E. B. Lyman, a member of the public relations staff of the Standard Oil Co. (New Jersey) and editor of the Lamp, official publication of the company, has been granted a leave of absence for 6 months. He is now engaged in public relations work for PAW with headquarters in Washington, D. C.

John Braybrook, for 14 years with Tropical Oil Co. at El Centro, Colombia, has been transferred to the company's Toronto, Ont., office.

Charles E. Buck, district geologist for Skelly Oil Co., has been transferred from Topeka, Kans., to Jackson, Miss.

W. J. Larson, Union Oil Co., has been elected chairman of the Los Angeles Basin chapter of A.P.I. for 1944, and **Lloyd Metzner,** Signal Oil & Gas Co., was elected vice chairman. **Dave M. Anderson** of Lane-Wells Co., was elected secretary-treasurer, and **Knight Templeton** assistant secretary-treasurer.

E. E. Roth, chief geologist of Columbia Gas & Electric Corp., has been elected vice president of United Fuel Gas Co., a subsidiary. He has been associated with the Columbia system since 1927 in charge of the geological and gas depletion departments of United Fuel and other associated companies.

Edward Jonas, a member of the French Chamber of Deputies at the outbreak of the war, is now an independent oil operator of Wichita, Kans., and getting his first production in Barton County, Kansas.

J. F. O'Shaughnessy, Wichita, is the new president of the Kansas Independent Oil and Gas Association. He succeeds **E. B. Shawver,** Wichita. New vice presidents are Shawver, **John Denman, Jr.,** Independence, and **W. H. Bird,** Wichita. **Theodore Gore,** Wichita, was elected secretary and **Lloyd Pickrell,** Wichita, became treasurer.

A. W. Cullen, assistant geologist for Continental Oil Co., has been transferred from the Denver, Colo., office to Casper, Wyo.

Roland Ring, formerly chief engineer in the Houston, Tex., office of Sperry-Sun Well Surveying Co., has been promoted to assistant to the general manager.

Thad Johnson, who was a member of Sun Oil Co.'s seismograph department, has left the company to become sports editor of Beaumont (Tex.) Enterprise.

Robert Pavlovic, formerly assistant geologist with Tennessee Valley Authority, has joined the geological department of Magnolia Petroleum Co. at Jackson, Miss.

Capt. Hayden Phillips, a former shooter in the geophysical department of Oklahoma Pipe Line Co., has been placed in command of the Thirty-eighth Air Base Headquarters and Air Base Squadron at Will Rogers Field, Oklahoma City, Okla.

D. O. Howard, petroleum engineer for Oklahoma Corporation Commission, has submitted his resignation, effective January 25, to enter the U. S. Marines at San Diego, Calif. **Thomas D. Bailey,** assistant, will fill the vacancy temporarily.

Leo R. Newfarmer and **C. W. Faris** are new department heads in the Midland, Tex., office of Shell Oil Co., Inc. Newfarmer, former district geologist at San Antonio, becomes West Texas-New Mexico district geologist, succeeding **K. S. Ferguson,** who resigned. Faris, in Shell service about 10 years, went to Midland from Lake Charles, La., to be division exploitation engineer. He replaces **Ralph P. Fitting,** who resigned to open an office as an independent petroleum engineer.

P. A. Wallace, a football star when he was attending University of Oklahoma, has resigned from the geological department of Amerada Petroleum Corp. to join Ray Stephens, Inc., and Stephens Brothers, in Oklahoma City, Okla.

Dr. Oliver A. Ohmann, professor of psychology and head of the department of philosophy and psychology at Cleveland College, has been appointed assistant to **A. A. Stambaugh,** vice president in charge of general sales of Standard Oil Co. of Ohio, in Cleveland, Ohio.

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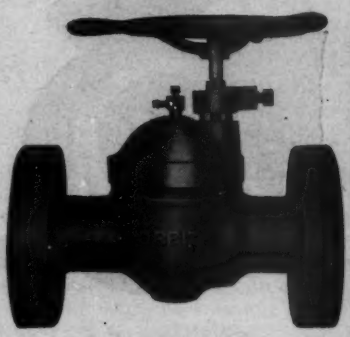

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If you have a control problem involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff—always at your service.

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AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada

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Market Developments

CURRENT market emphasis east of the Rocky Mountains is centered on kerosene and other types of fuel oil chiefly because of seasonal conditions and for the reason that working stocks at most refineries and terminals have been drawn down to a mimimum.

The Pacific Coast situation is substantially different. California refiners are chiefly concerned over the decline of motor-fuel stocks and the inability to satisfy the restricted civilian requirements at the existing levels of operation. Details of a program for reducing civilian consumption are receiving consideration in Washington, D. C. Probably the first move will be for tighter control of supplementary coupons with a reduction in the basic rations to follow. In this connection, it is of market interest to note that California was the only state in the country to receive a substantial increase in production quota for February. Obviously, the higher schedule on production is designed to correct some of the acute shortages as well as meet the anticipated increase in military demand.

Early season concern over the prospects for heating oil supplies on the East Coast have been almost entirely dissipated by substantial increase in stocks over the past 3 months. Fears are growing, however, that civilian motor fuel demands in District 1 will be even more limited this summer. During the past 12 weeks, East Coast gas-oil and distillate stocks rose more than 73 per cent and at current levels concern is diminished over the outlook for the entire heating season.

The East Coast motor-fuel situation, on the other hand, has shown virtually no improvement over the past month. Stocks now are only slightly higher than they were on December 1. If the rate of increase of the past 5 weeks is continued without acceleration to March 31, stocks of gasoline at the beginning of the consuming season will be less than 50 per cent of normal. Usually substantial additions to stocks are made during this period.

Latest reports on kerosene show that efforts to improve its position have been unavailing. According to these reports stocks have declined somewhat in recent weeks and are at the lowest point of the season. Residual fuel oil stocks have also continued their tendency to taper off though they are still comparatively good.

California refiners have virtually eliminated production of third-grade gasoline for the purpose of increasing base stocks of regular automotive fuel as one approach to the increasing shortage. Standard Oil Co. of California last week joined the growing list of manufacturers who have discontinued distribution of third-grade gasoline for the duration.

With completion of each new aviation-gasoline refinery on the Gulf Coast where a major percentage of war-project capacity is centered, the manufacturing schedule becomes all the more rigid. Many plants are scheduled for completion between now and April 15, meaning that the supply of civilian products will undergo greater contraction before mid-year is reached.

A.P.I. Refinery Report

Week Ended January 8, 1944

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	148	2,883	345	1,020
Ind., Ill., Ky.	727	15,735	3,019	5,933
Okla., Kan., Mo.	331	7,063	1,071	1,901
Censored area*	2,118	35,323	16,266	21,630
Rockies	107	1,513	689	388
California	833	15,137	34,341	10,657
Total 1-8-44	4,264	77,654	55,731	41,509
Total 1-1-44	4,453	76,302	57,350	42,431
Total 1-9-43	3,614	82,598	72,795	43,415

*Reports combined on East Coast, Texas Gulf Coast, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
January 8, 1944	238,114,000
January 1, 1944	240,992,000
January 9, 1943	232,191,000

*Excludes unrefinable in California.

REFINERY PRICE SUMMARY

(Prices as of January 18, 1944)

Quotations are f.o.b. plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

REFINERY GASOLINE

Octane (A.S.T.M.):	80†	72-74	68-70	62-66
Mid-Continent*	‡6.00-6.25	5.750-6.000	.....	5.625
Gulf Coast	6.00-6.50	§5.750-6.250	§5.750-6.250	§5.250-5.750
Northeast Coast	9.80	9.2	9.2	.....
California	.....	6.255-6.500	5.750-6.125	5.125-5.500

*Basis Group 3. †1939 C.F.R. (research method). ‡Inland Texas and adjoining counties in Arkansas and North Louisiana. §Unleaded.

KEROSENE AND DISTILLATE FUEL OIL

Product—	Kerosene†	No. 2	No. 3	No. 5	No. 61
Mid-Continent*	4.125-4.375	3.500-3.625	3.375-3.500	$0.85	$0.80-1.27
North Louisiana*	4.125-4.375	3.500-3.625	.....	.....	0.80-1.27
Pennsylvania	6.000-6.125	5.875-6.125	5.875-6.000	.....	.....
California	4.500-5.500	5.500	5.500	‡1.10-1.35	‡1.10-1.18
Northeast Coast	6.800	6.700	6.700	1.95	1.65
Gulf Coast	4.125	3.750-3.875	.....	1.35	0.85

*Reflecting OPA ceilings, depending on destination of shipments. †Quotations for 41-43 gravity. ‡Range depends on gravity. §Pacific Specification 300. ‡Pacific Specification 400.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.750	5.700
North Texas	4.375	5.250
North Louisiana	4.375	5.250
California	4.875	5.500

LUBRICANTS

PENNSYLVANIA GRADE—	
Bright stock*, 10 pour point	30.5
Bright stock*, 25 pour point	25.0
Steam refined, 600	15.0
Neutral oil†, 10 pour point	34.0
Neutral oil†, 25 pour point	28-32.5
*No. 8 color, 145-155 at 210, 540-550 flash. †150 vis. at 70 F., 3 color, 400-405 flash.	
MID-CONTINENT—	
Bright stock, 150-160 D, 0-10	23.00
Neutral oil‡, 200-3	15.00
‡0 to 10 pour point.	
GULF COAST—	
Pale oil, 200-3	8.75
Pale oil, 500-3½	10.00

WAX

Oklahoma, 124-126, w.c.s.	4.250
Pennsylvania, 122-124, w.c.s.	4.250
NEW YORK (in bags)—	
Refined, 130-132 (A.m.p.)	7.00
Crude, 124-126 (W.s.)	6.00

TANK-WAGON PRICES

(Gasoline prices based on regular grades in cents per gallon).

	Dealer tank wag.	Combined tax	Kero. tank wag.
Baltimore, Md.	15.95	5.5	10.5
New York	16.10	5.5	10.1
Philadelphia	16.20	5.5	11.9
Washington, D. C.	15.20	4.5	11.3
Chicago	14.10	4.5	10.6
Cleveland, Ohio	14.50	5.5	*9.0
Atlanta, Ga.	16.90	7.5	*11.5
Denver, Colo.	14.50	5.5	11.0
San Francisco	14.50	4.5	11.5
Tulsa	16.50	7.0	8.5

*Includes 1 cent state tax.

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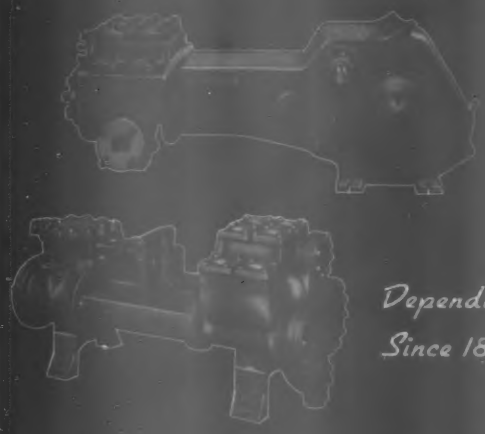

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Equipment Progress

Continuous Butadiene Analysis

Shell Development Co. has designed and improved a special refractometer assembly which analyzes automatically and continuously a plant stream high in butadiene concentration, by the measurement of the refractive index of the fluid stream as it flows from the producing unit at the pressure at which the butadiene is synthesized.

The assembly includes a refractometer equipped with a dipping prism in a superatmospheric pressure cell in which constant temperature is maintained, and in which both pressure and temperature are the same as those in the processing unit. The liquid stream or a portion of it from the processing unit flows through this cell continuously, and its refractive index may be determined at any instant, and from tables or curves the known butadiene purity may be determined immediately without removing or separately testing a sample, which boils at about 22.5° F. The entire unit is encased in a cabinet connected by suitable piping to the unit pipe line carrying the stream to be tested.

Trade Literature

Oil Well Supply Co., Dallas, Tex.—Catalog No. 47, a 445-page complete general catalog covering not only major equipment items but also tubular goods, wire lines, valves, fittings, and the various accessories, hardware, and other supplies used in the oil fields. The catalog has an ingenious section finder which facilitates opening the catalog at the beginning of the desired section. The company has also issued Machinery & Equipment Catalog No. c-47. This catalog presents in convenient form some of the major machinery and equipment items manufactured by Oil Well.

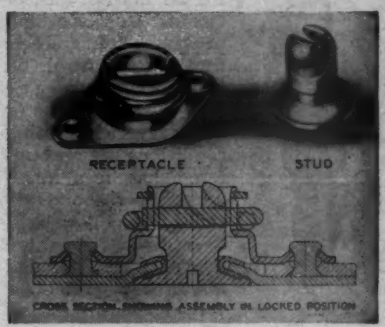
National Airoil Burner Co., Inc., 1284 East Sedgley Avenue, Philadelphia 34, Pa.—Bulletin 21, on the company's line of steam atomizing oil burners and auxiliary equipment. The 16-page bulletin is generously illustrated.

Copper Brass & Research Association, 420 Lexington Avenue, New York, N. Y.—A new and complete treatise showing methods and devices for bending pipes and tubes of copper and its alloys. It contains 80 pages of text with 113 figures and illustrations including 35 full pages of unit weights of tubes of different alloys with varying diameters, wall thicknesses and shapes.

Scene of the ceremonies attending presentation of the Army-Navy "E" award to Twin-Disc Clutch Co., Racine, Wis. Assembled employees and guests heard addresses by Capt. Logan McKee, U.S.N., Bureau of Ships, and P. H. Batten, president of the company

Elastic Stop Nut Corp., Adds Fastener to Line

W. T. Hedlund, president of Elastic Stop Nut Corp. of America, Union, N. J., announces that his organization has acquired world rights to a new fastener which will add to the scope of the company's work in present war production as well as in postwar commercial use. The new fastener is a spring-lock device invented by Dr. E. L. Mack, and perfected by Aircraft Parts Development Corp., Summit, N. J., under the direction of D. C. Hungerford.



The new fastener is a lightweight unit of extremely rugged construction and is particularly suited for holding the engine cowlings of high-speed war planes. It meets specifications for use in Army and Navy airplanes.

In addition to its important uses on airplanes, this fastener is suited to many postwar commercial applications, such as access plates on farm machinery, panels on motor trucks, home heating units, radio equipment, and at any point where a quick-acting vibration-proof nonrattling fastening is needed.

Bethlehem Will Handle Bridgeport Condenser and Heat Exchanger Tubing

Bridgeport Brass Co., Bridgeport, Conn., announces the appointment of Bethlehem Supply Co. as sales representative for its line of condenser and heat-exchanger tubing.

The Bridgeport company has developed a number of special alloys to meet the needs of the oil-refining industry, which is making more and more products of a chemical nature.

These are arsenical admiralty, for general service; arsenical muntz (patented), for sulfur-bearing oils and gases; red brass, for corrosive waters, and duplex tubing, for synthetic rubber, etc.

Emergency stocks of condenser tubes are maintained in some of the stores of Bethlehem Supply Co. as well as the warehouse of Bridgeport at Houston, Tex.

New Fisher Manual Control Valve

A new manual control valve type 461M for all liquids, gas, or steam service that provides dependable throttling control on installations where high-pressure drops or other severe operating conditions are encountered, has been introduced by Fisher Governor Co., Marshalltown, Iowa. This valve is particularly adapted to refinery service for handling residual oils with coking properties or for pressure breakdowns off reaction chambers.

Valve-body construction features a single-seated plug-type inner valve, sleeve guided, and streamlined body contours providing low head loss to reduce to a minimum the possibility of deposition of solids within the valve structure. Inner valve, sleeve guide, and seat ring are hardened stainless steel, carefully machined to withstand severe operating conditions. The inner valve is also chromium plated.

Extra heavily constructed topwork assembly combines heavy load-carrying ability with ease of operation. Special indicator plate and mechanism permits accurate valve positioning. Drive is through spiral gearing and Acme threaded parts.

This controller can be easily converted to automatic diaphragm motor valve control by the addition of spring and diaphragm assembly to the manual operator topwork. This conversion provides an automatic control unit with manual overrider making it possible to manually position the inner valve at any time even against full spring compression and/or diaphragm pressure.

Among Equipment Men

Yeaton Promoted by Roebling Co.

S. E. YEATON

Stuart E. Yeaton, native of Seattle, Wash., and graduate of University of Washington, has been made manager of sales of the Electrical Wire and Cable Division of John A. Roebling's Son's Co., Trenton, N. J. Subsequent to his graduation from the university he was employed as a salesman in the Seattle branch from 1934 to 1941, at which time he was made assistant to W. G. Marks, president of the California Corp. of Roebling company at San Francisco. In May 1943, he was transferred to the main office at Trenton as manager of sales of round, flat wire and specialties.

Crane Appoints Dwyer Manager Sales and Branches

James A. Dwyer has been appointed general manager of sales and branches of Crane Co., with headquarters in Chicago.

Dwyer joined the Crane organization in 1917 at the Philadelphia branch. He has been successively estimator, salesman, chief clerk, branch sales manager, assistant branch manager, branch manager, and district manager. About a year ago he was made manager of branch houses, which responsibilities he will continue to assume in addition to his new duties as general manager of sales.

Howell Named to New Post by U. S. Steel

Benjamin F. Fairless, president of United States Steel Corp. of Delaware, has announced the appointment of M. D. Howell to the position of assistant to president, a newly created post. Howell will continue as vice president, secretary and treasurer of the Delaware corporation in addition to his new duties.

Howell presently coordinates the activities of the corporation relating to government finance facilities, amortization, renegotiation and termination of war contracts and production planning, and in his new position will be assigned additional special duties by the president.

Howell was formerly vice president of Carnegie-Illinois Corp. prior to which he was a vice president of Chemical Bank & Trust Co. of New York.

New Sales Executive for Templeton, Kenly & Co.

A. C. LEWIS

A. C. Lewis, associated with Simplex jacks for more than 30 years, has been appointed vice-president in charge of sales of Templeton, Kenly & Co., Chicago, Ill., teaming up with P. H. McManus, J. B. Templeton, president, has just announced. Lewis' will make his headquarters in Chicago, but will maintain contact with Canadian distributors through frequent trips to the dominion.

On joining Templeton, Kenly & Co. in 1912, Lewis was sent to Toronto to open a Canadian manufacturing plant for Simplex jacks. Just prior to the outbreak of World War I, he made a trip to England and the continent to establish European distribution for the Canadian factory. When Canadian manufacturing temporarily ceased in 1915 and the plant equipment sold, Lewis resigned to form A. C. Lewis Co., Ltd., Canadian distributors for Simplex jacks. Manufacturing was continued by William Kennedy & Sons, Ltd., at Owen Sound, Ontario.

In 1928, Railway & Power Engineering Corp., Ltd., took over the assets of A. C. Lewis Co., Ltd., including the distribution of Templeton, Kenly & Co. products, Lewis continuing as special representative of the sales department. He recently resigned to assume his new post with the Chicago firm.

Kellogg Returns as Head Of Kellogg Switchboard & Supply Company

The board of directors of Kellogg Switchboard & Supply Co. recently announced that James G. Kellogg has been elected president of the company to succeed Maj. Maurice K. McGrath, who had resigned. Major McGrath will continue in his capacity as a company director.

James H. Kellogg was elected executive vice president of the company, succeeding his father who was elected president. He has been secretary of the company for about 5 years and will continue in that office.

Century Executive Honored

R. J. Russell, vice president and sales manager of Century Electric Co., St. Louis, Mo., has been elected president of the Associated Industries of Missouri.

Classified Advertising

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SITUATIONS WANTED

OIL ACCOUNTANT, knowledge of Federal and State taxes, draft deferred. Box B-994, The Oil and Gas Journal, Tulsa, Okla.

EXECUTIVE with thirty years' experience in the oil business part of this time with major company and as vice-president of major independent company also as independent oil producer desires connection with independent company or with parties with money to invest in the oil business as there are many opportunities in the southwest to make money. Box B-262, The Oil and Gas Journal, Tulsa, Okla.

REFINERY SUPERINTENDENT: Now refinery superintendent of large independent, 18 years experience covering cracking, and general refinery operation. Some asphalt experience. Desire change for personal reasons. Age 38, married, with children. Would like connection with progressive independent. Box B-105, The Oil and Gas Journal, Tulsa, Okla.

WOULD like to contact company which contemplates placing man of ability in Mid-Continent area to handle sales, or act as representative in this territory. Ten years in charge of sales for eastern manufacturing company; also 10 years in drilling business. Best of references. Box B-991, The Oil and Gas Journal, Tulsa, Okla.

MIDDLE AGE man wants position as farm boss, or pump and look after production. Reference exchange. Box B-976, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST, 10 years geological, 5 years land, title-curative experience Mid-Continent and Illinois districts, desires job with strong independent operator. Draft exempt. Box B-119, The Oil and Gas Journal, Tulsa, Okla.

OUTSTANDING Specialist in Preventing Loss to Life and Property from Fire in Industry, will consider position with progressive organization. Box B-112, The Oil and Gas Journal, Tulsa, Okla.

AVAILABLE: Young man, B.S. in Chemistry, draft 2-B, with research, development, and production experience in petroleum, resins, and synthetic rubber. Training in chemical engineering. Position desired where experience and background can best be utilized. Minimum salary $3600. Box B-11, The Oil and Gas Journal, Tulsa, Okla.

LAND AND LEASE MAN and general production and field experience throughout the Mid-Continent area, capable of forming drilling block, leasing, title work, drilling contracts and carrying deal through to completion. Would like connection with Oil Company, Independent or leading Geologist and if possible with a good future. Box B-118, The Oil and Gas Journal, Tulsa, Okla.

ENGINEER with wide experience in electrical logging and geology, desires connection as logging specialist to collaborate with geological department. Box B-117, The Oil and Gas Journal, Tulsa, Okla.

SUPERVISION of drilling and production High and low pressure wells. Married, Age 38, 2BH Classification. Now employed. Box B-115, The Oil and Gas Journal, Tulsa, Okla.

DRILLING and Production Foreman for past fourteen years with major company desires connection with growing company. Box B-114, The Oil and Gas Journal, Tulsa, Okla.

SITUATIONS WANTED

GEOLOGIST, 18 years experience drilling wildcats and field wells in southwest Texas; now chief Geologist, Independent Oil Company; would consider similar position with operator who would allow personal Royalty and Lease trades. Draft Classification 2-AH. Box B-975, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING and Production Supt., or Tool Pusher, 27 years experience, would like connections with small growing company, would take part interest and living salary. Can furnish best of references. Owned own tools and production 15 years. Age 44. Can go anywhere. Box B-981, The Oil and Gas Journal, Tulsa, Okla.

TECHNICALLY trained man, age 45, experience in construction, operation and maintenance of power plants, gasoline plants and refineries. Last 15 years in responsible positions in the oil industry. Now employed as superintendent in small refinery. Desire suitable position with independent oil company. Best of references. Box B-971, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS Instrumentation Engineer with 20 years' experience in oil refining, capable of supervising operation topping, cracking and Polyforming units. Good reference. Available Feb. 1, 1944. Box B-102, The Oil and Gas Journal, Tulsa, Okla.

CIVIL ENGINEER, 22 years in South Texas fields, desires permanent position where experience on production, pipe lines, drilling, installation, office management, could be used. C. A. Tips, 1505 West Woodlawn, San Antonio, Tex.

REFINERY ENGINEER would like to associate with refinery equipment or supply house on West Coast. Age 43, thoroughly experienced all types of refinery equipment. Box B-993, The Oil and Gas Journal, Tulsa, Okla.

LAND MAN: Single man, age 50, employed at present, wishes to make new connection along following lines: Abstracter of land titles by profession; wide experience in leases, agreements, contracts, rights of way, payments of lease rentals, damages, etc. Will consider any inquiry; prefer part time outside employment. Any location. Box B-992, The Oil and Gas Journal, Tulsa, Okla.

HELP WANTED

• • • • WANTED • • • •

Major oil company with continent-wide operations and research seeks graduate technical men of the following qualifications:

MECHANICAL ENGINEERS—with petroleum refinery or similar experience. Should be familiar with refinery design, estimating, construction, mechanical equipment, engineering materials, and utilities systems. Process knowledge desired although not essential.

CHEMISTS AND CHEMICAL ENGINEERS interested in research, design, or plant operation. Should have training and experience in refinery or other industrial organizations.

Work not of a temporary nature. In reply state experience, education, age, marital status, draft classification and salary expected, include small snapshot (not returnable). Replies strictly confidential. Applicants now employed at highest skill in war industries not solicited. Box B-670, The Oil and Gas Journal, Tulsa, Okla.

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LARGE MANUFACTURER of widely diversified machinery lines wants an engineer with experience in petroleum industry, to coordinate and promote selling activities between factory and field organization. Moderate amount traveling necessary. Excellent opportunity for energetic young man desiring permanent position. Box B-972, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

CHEMICAL plant in Detroit area wants experienced or recently graduated mechanical and chemical engineers. Also men who expect degrees in near future. Important defense work. Write giving references, education, experience and salary desired. Must qualify under WMC regulations. Box B-861, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Assistant superintendent for modern Midwest refinery. Must be familiar with plant maintenance and operation. Please give full particulars on past experience and technical training and state draft classification. Box B-100, The Oil and Gas Journal, Tulsa, Okla.

WELL-KNOWN industrial instrument company desires to expand sales organization looking forward to postwar activities. Splendid opportunity for technically trained engineers, preferably those with experience in contacting oil industry. Locations open are Houston, New York, Baton Rouge, Pittsburgh, Philadelphia, Los Angeles, and San Francisco. Box B-996, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Experienced instrument man by large independent inland Texas refiner. Excellent opportunity for advancement. State qualifications and draft status in first letter. Box B-998, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Experienced salesman for southwest territory by large alloy tube manufacturer. Write to Box B-995, The Oil and Gas Journal, Tulsa, Okla., giving full details.

GEOLOGIST with wide experience in reconnaissance and detailed surface mapping for six months contract beginning April first, to survey large tract in Canada. Experience in coordinating seismograph survey with geological conditions necessary. Experience in supervising drilling wells also necessary. Write giving references, training, experience and salary desired. Box B-113, The Oil and Gas Journal, Tulsa, Okla.

CIVIL AND MECHANICAL ENGINEERS. Pipe Line Experience. Headquarters, Tulsa. PIPE LINE PUMP STATION ENGINEERS, expert with Diesel type engines for work in Oklahoma. 48-hour week. Major pipe line company. State qualifications, draft status, and salary desired. Box B-997, The Oil and Gas Journal, Tulsa, Okla.

LARGE progressive oil field equipment manufacturer in Houston, Tex., requires the services of a first-class metallurgist to head department. If qualified and interested, write Box B-110, The Oil and Gas Journal, Tulsa, Okla.

WANTED

OIL structure, Government data covering same. Want to drill two wells, attractive proposition open. Address P.O. Box 1372, Great Falls, Montana.

WANTED: Distributors for Oklahoma and Mississippi to handle a general line of drilling muds. Drilling Mud Corp., 315 Thompson Bldg., Tulsa, Oklahoma.

WANTED TO BUY FOR CASH: Oil and gas production—will purchase wells to salvage. Rogers & Wright, phone 30-171, 715 Peoples Bldg., Charleston, W. Va.

FOR SALE—MAPS

FLORIDA OIL MAP

Over 90 wells drilled for oil tests. Complete list of wells drilled in state giving depth and locations. A good map showing all counties, $1.50 each.

TRI-STATE MAP SERVICE
P.O. Box 287 Daytona Beach, Fla.

FOR SALE—MAPS

685 oil fields in South Texas and Louisiana now mapped and maintained daily; show all intimate details of ownership and development. 2 ft. square. Price $3.50 for each field. Also County and Base Maps.

ZINGERY MAP CO. Houston, Tex.

Journalisms:

CALCULATORS, adding machines and linotypes in the Journal offices have been churning vigorously for weeks grinding out the statistical results of 1943 for publication in the Annual Number January 27. Predicting the future on the basis of the past is an art long recognized in all phases of the industry. In order to show specifically where the industry stands the Journal concentrates its entire staff on the task of computing reserves, recording and analyzing trends in production, refining, drilling, demand, transportation and the scores of other pertinent operating data. The results, we are told by appreciative readers, are outstandingly unique. It's naturally a source of pride to Journal personnel that the Annual is retained at a handy spot for reference throughout the year by its subscribers. (Remind us to bill the circulation department for this plug.) We aren't strong for Hollywood adjectives but if policy permitted we could easily throw in several for the Annual. Nor is the Annual devoted entirely to summation of last year's statistics. There are sufficient supporting data to forecast the general trend of 1944 drilling operations, approximately what the industry will require in major equipment items, how the transportation outlook fits into the general program of supply and what will be needed in the way of crude oil and products.

SCHEDULED for next week's Engineering and Operating Section is an article by a staff member on the equipment used for reverse circulation. This article is one of three by the author, the first appearing on page 41 of this issue. According to the author, reverse-circulation equipment may range from a complete rotary rig which has drilled the hole and set pipe, to only a light pulling unit, pump and prime mover. Any well being drilled by the rotary method with proper blowout-prevention equipment, or any producing well equipped with casing, tubing and a stripper-type tubing head can be reverse circulated with little trouble.

A SPECIAL section in the issue of February 3 will be devoted to a complete and highly illustrated description of the recent addition of 15 Plant to the Marcus Hook refinery of Sun Oil Co. This plant further increased the refinery's catalytic-cracking capacity, already the largest in existence. The plant was built at a cost of $13,000,000, which was borne entirely by Sun. The description of the unit will be in the form of several articles that have been especially written by the company's engineers, each devoted to a particular unit, plus an over-all description by a member of the Journal's staff. The photographic illustration will be supplemented by several full-page flow diagrams.

CALENDAR

January

KANSAS OIL MEN'S ASSOCIATION, annual meeting, Broadview Hotel, Wichita, Kans., January 24-25.

February

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, Waldorf-Astoria, New York, February 20-24.

AMERICAN SOCIETY FOR TESTING MATERIALS, spring meeting and committee week, Netherland Plaza Hotel, Cincinnati, Ohio, February 28 to March 3.

March

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, SOCIETY OF EXPLORATION GEOPHYSICISTS, AND SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS, annual meetings. Dallas, Tex., March 21-23.

WESTERN PETROLEUM REFINERS ASSOCIATION, thirty-second annual meeting, Jefferson Hotel, St. Louis, Mo., March 28.

April

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, annual meeting, Rice Hotel, Houston, Tex., April 10, 11 and 12.

June

AMERICAN SOCIETY FOR TESTING MATERIALS, forty-seventh annual meeting, Waldorf-Astoria Hotel, New York, June 26-30.

November

AMERICAN PETROLEUM INSTITUTE, annual meeting, Stevens Hotel, Chicago, November 13-16.

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